THE HEATING AND VENTILATING MAGAZINE

Cooperstown, N. Y. AUGUST, 1917 1123 Broadway, New York

Correct Method of Piping Dry Returns

How "Back-Firing," and Other Troubles May Be Overcome in Gravity Steam Heating Work.

In many gravity steam heating systems the construction of the building or other considerations require the placing of a return line above the general water-line of the system, this constituting what is commonly termed a "dry return" to distinguish it from the returns located below the general water line of the system and filled with water on this account. Every heating man knows that on a two-pipe gravity job a wet return is always preferable to a dry return and almost every one will use a wet return if conditions permit. Where insurmountable obstacles to a wet return are encountered and a dry return is, of necesity, used, certain features will make this dry return (or its equivalent) operate satisfactorily whereas the omission of such features is liable to lead to troubles more or less unexplainable.

Some old and seasoned heating men will smile and think that they will never have trouble of this kind but do not be too sure! One of the best heating contractors of the metropolis put in heating systems for twenty years and has a more or less country wide reputation—but the dry return got him! And after twenty years experience too!

What *are* the troubles likely to be experienced with a dry return and what are the causes of the troubles? Since the dry return is not filled with water at any time, it must at all times be filled with either steam or air, depending on whether the system is in operation or not. At certain times when the system is starting up or closing down it may be filled with a mixture of both steam and air.

A successful two-pipe gravity steam

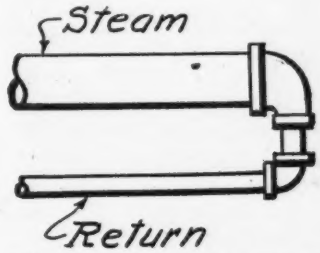


FIG. 1—COMMON DRIP ON STEAM MAIN.

system should supply steam to the radiators through the steam main and its risers and branches and should return the water of condensation to the boiler through the return main, its risers and branches. As soon as a system is piped so that steam can be supplied through both supply and return mains at the same time trouble begins to brew. A wet-return system makes it impossible for steam to enter the return main and to be fed to the radiators through the return end; thus many troubles are avoided. On the risers, however, conditions remain the

same and a discussion of the riser problem is taken up later in this article.

The most exasperating thing about the matter of the dry return is that some jobs will work to a satisfactory extent without any safeguards at all and others will give any amount of trouble and necessitate considerable expense to rectify.

DISPLACEMENT OF AIR FIRST REQUISITE OF DRY-RETURN SYSTEM.

The first requisite of a dry-return system is the design of the supply and return mains so that on starting up the system the steam will displace the air in the pipes in a quiet and continuous manner until all the air is expelled from the system and its place taken entirely by steam and condensation. The second requisite is that during this process the steam should be kept from entering the return conection of

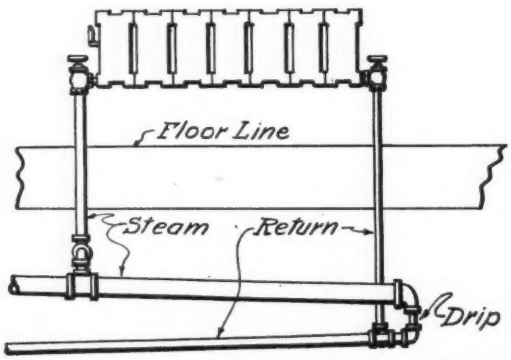


FIG. 2—EXAMPLE OF RADIATOR THAT WILL BACK-FIRE.

the radiators because if this happens it will reach the air valve on the return end, and close it, long before the air has been expelled from the radiator. The result of such a process is a radiator hot at both ends and air bound in the middle sections.

A TYPICAL ILLUSTRATION OF "BACK-FIRING" FROM THE RETURN END.

If the paths whereby the steam enters the dry return pipe are considered, a better idea is had of how the suggestions and ideas later illustrated will remedy the trouble. Suppose a two-pipe, gravity, dry-return system to be starting up—the steam flows out along the stem main and compresses the air in the piping and radiators, driving it gradually out of the system through the automatic air valves. Probably at the end of the steam main and at various intermediate points the main is dripped into the return line, the drip on the end of

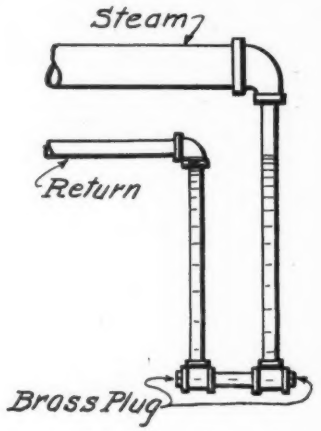


FIG. 3—WATER-SEALED DRIP ON STEAM MAIN.

the main being arranged somewhat as shown in Fig. 1. With such dripping the steam passes down into the return main and will work up into the nearest return connections, especially if radiators are connected as shown in Fig. 2, causing adjacent radiators to feed from the return end, or to "back-fire," as it is sometimes termed.

That the steam does this is a positive fact and the back-firing is caused entirely by the steam travelling around such a drip connection in less time than it takes to blow the air out of the adjecent radiators. *If* the radiators relieved of air *rapidly* enough or *if* the steam passed around the drip connection and back-fired *slowly* enough—so that the air were all expelled from the radiator before the back-firing steam closed the air valve—all would be well, as the admission of steam to a radiator through the return end, after all the air has been expelled, is not a serious matter.

Trouble from this source, however, is indeed so common as to be guarded against by almost all experienced heating men by water-sealing the drip as shown in Fig. 3. If the seal is made about 3 ft. deep it will effectually prevent such trouble.

Similar to this trouble, and closely related to it in cause, is the connection of a small radiator located on the same ceiling with the mains, some-

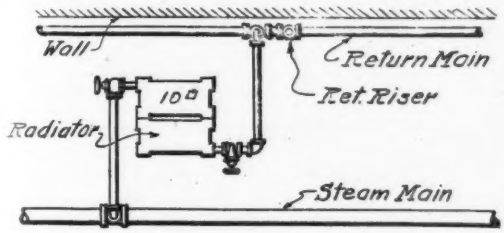


FIG. 4—SHORT-CIRCUITING THROUGH SMALL RADIATOR.

what as illustrated in Fig. 4. Steam flowing out the steam main will enter this small radiator of, say, 5 to 10 sq. ft., and blow the air out of it in one-tenth to one-fifth the time it takes to blow out a 50 sq. ft. radiator located above on the return riser shown. As a result during the remaining nine-tenths to four-fifths of the time it passes through the small radiator, out into the return main, up the return riser, and back-fires the 50 sq. ft. radiator.

REMEDY FOR "BACK-FIRING."

Now as to the remedy. The same scheme applied to the drip connection will also give satisfaction, if used on the return from the radiator. This is illustrated in elevation, Fig. 5, where both the radiator returns and the return riser are shown water-sealed. The water seal does not need to be quite as deep in this case because the difference between the pressure in the radiator return and the pressure in the main return will be less than the difference between the pressure in the steam main and the pressure in the return main. The less difference is caused, of course, by the fall in pressure of the steam while passing through the radiator.

Another remedy is to water-seal the whole return by the establishing of a false water-line, as shown in Fig. 6. This can be done if there is sufficient room between the level of the steam main and the level of the return main. Usually about 24 in. difference is the minimum which will give satisfaction, the false water-line being made about midway between the two levels, thus giving 12 in. of water seal and 12 in. from the false water-line to the steam main for good drainage.

The rise in the return pipe made to establish such a false water line must be connected to a small line from the steam main, this line being called a "balance" pipe and shown in Fig. 5. Its real purpose is to admit steam to the top of the riser so as to break the syphonic action. Without such a balance pipe the return main will fill up with water until the level of the false water-line is reached and the water

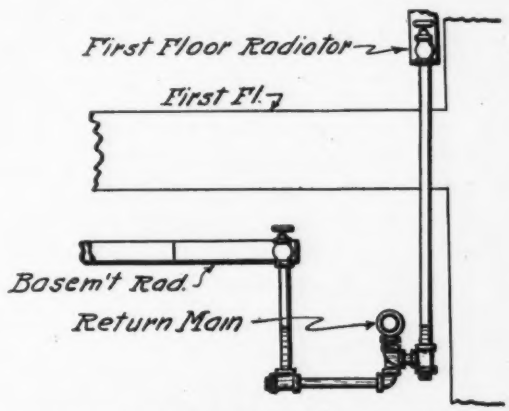


FIG. 5—WATER-SEALING TO PREVENT BACK-FIRING.

will then overflow down into the lower level. Owing to the longer leg on the low side of the rise a perfect syphon is created which will not only pull all the water out of the high portion of the return main, but will also unseal all connections to it and at the same time cause the water to return to the boiler in intermittent slugs, thus fluctuating the water-line. The amount

of such fluctuation will depend on the relative capacity of the water contained by the false water-line which is syphoned out and the area of water surface in the boiler.

DIFFICULTIES WITH DRY RETURNS ON BASEMENT FLOORS.

Difficulty may be sometimes experienced where dry return mains are run along the basement floor. If it is attempted to water-seal the steam pipe drips connected to such a return the water-seal must be placed above the floor, resulting in a perfect syphon. If a balance pipe is introduced at the top of such a syphon then the water seal is bypassed and rendered useless. In a case of this kind a knowledge of plumbing is most beneficial for in plumbing (in cases where syphonage is liable) non-syphon traps are frequently used when venting or breaking the syphonic action by other means is impossible. These traps simply retain enough water to resist syphonage or to re-seal themselves immediately should they be syphoned; as the amount of water retained in a steam main drip seal is small, its syphoning out will do no harm, while all the good can be obtained if the loop is immediately re-sealed. Under such conditions an arrangement something like that shown in Fig. 7 will accomplish all that is required, the large piece of pipe being two to three times the diameter of the drip pipe and retaining enough water to allow syphonage to take place and still re-seal the connection at once.

The danger of backfiring through a radiator is not as generally recognized by heating men as the danger of doing the same thing through a steam main drip connection and the argument is often advanced—when trouble is encountered from this cause—that the radiator connection cannot be the trouble because, if this were so, the radiators connected to the steam and return risers should do the same thing. The truth of the matter is that they *do*—if the conditions are right!

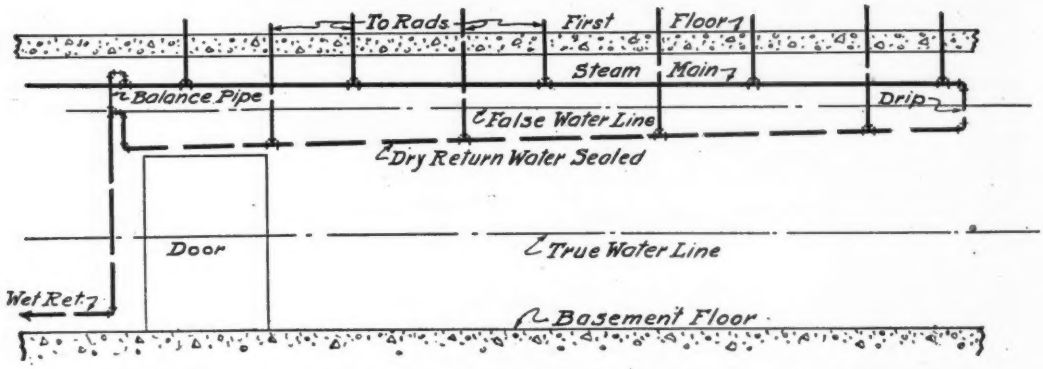


FIG. 6—RETURN WATER-SEALED BY ESTABLISHING FALSE WATER LINE.

Take, for instance, radiators connected as shown in Fig. 8; about 99 times out of 100 such radiators will work all right, but if one radiator is very *small* and the next very *large,* and especially if the steam riser supplying the small radiator gets the steam *first* or is a more *heavily loaded* riser then trouble is almost sure to occur. One job demonstrated this peculiarity

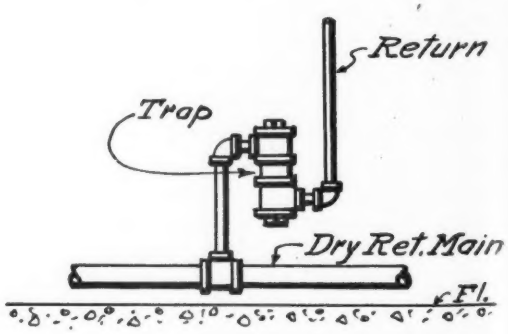


FIG. 7—NON-SIPHON WATER-SEAL.

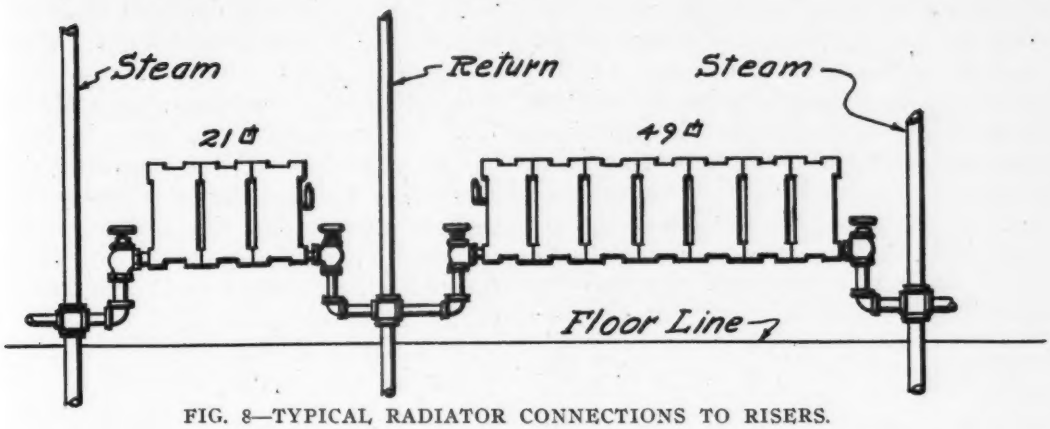


FIG. 8—TYPICAL RADIATOR CONNECTIONS TO RISERS.

most emphatically, the janitor having to remove the air valves on the larger radiators every morning and let them blow for some time before he succeeded in relieving the air.

Where the radiators are approximately the same size the action in each is more or less simultaneous but in cases of great discrepancies between the sizes some safeguards should be used. Several old authorities on heating recommend the use of various schemes, but they advocate their use on *all* radiators. Experience has shown that this produces an unnecessarily expensive job and it is entirely sufficient to use the safeguards suggested below only in cases where one radiator exceeds, by 50% or over, the next adjacent radiator (on the return end). Probably in all cases where the difference is less than this the steam from the smaller radiator will not get to the air valve on the larger radiator in time to cause air binding to a serious extent.

THREE METHODS OF TREATING RADIATOR RETURNS.

The three most satisfactory methods of treating the radiator returns under such conditions are illustrated in Fig. 9. In "A" a check is inserted in the return from the *larger* radiator only. A check in the return from the smaller radiator is, of course, not needed as there is no danger of steam coming across from the larger amount of surface. Care must be taken to provide for a vertical head of water above the check so as to insure the lifting of the flap without holding back the water in the radiator. As a general thing, where radiators are set near the floor this means that the check valve must be placed on the ceiling below—which may be objectionable for various reasons. "Impulse" check valves are recommended for such use.

In Fig. 9, the scheme shown in "B" leaves the ceiling below perfectly clear, but establishes a pocket for the

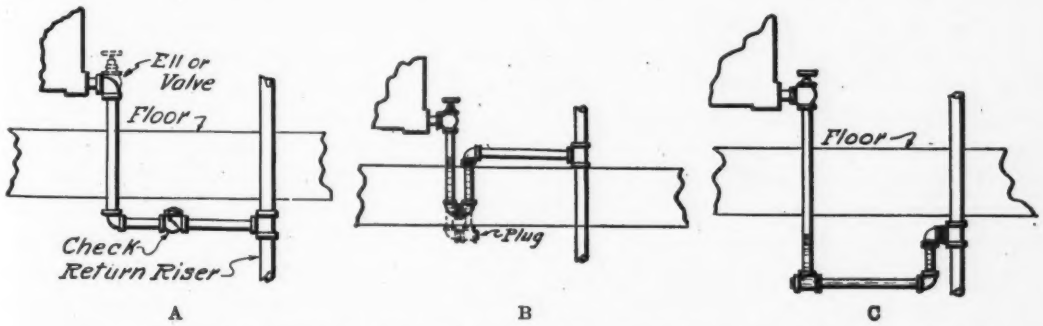


FIG. 9—THREE METHODS OF SAFEGUARDING RADIATORS FROM BACK-FIRING.

collection of rust which it would be difficult to remove. A better design would be to carry it through to the ceiling below and provide it with a brass plug as shown in dotted lines. Such a water seal could be used on the return ends of *both* the larger and smaller radiators, the seal on the small operating to prevent the flow of steam into the return riser and the seal on the larger radiator operating to prevent the entrance of steam through the return even if the steam had obtained access to the return riser itself.

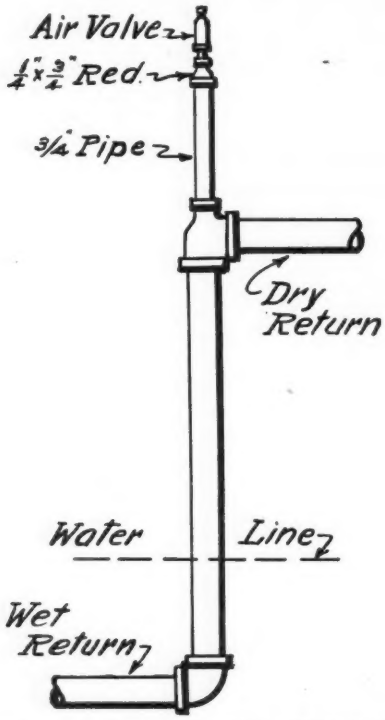


FIG. 10—AIR VENTING ON RETURN MAIN.

The seal shown in "C" is only a modification of the idea illustrated in "B" so as to make the runout come on the ceiling below, instead of above, the floor; otherwise the two schemes are quite similar but where compared with "A" it is readily seen that the runout in "C," in order to get a good water-seal, must come quite a little lower than the runout would come in "A."

One more point; it is important to remember that whenever a dry-return main drops under the water-line or becomes water sealed a pocket if formed which results in the collection of air at this point. The air is prevented from going forward by the water in the wet-return and is prevented from going back by the water and steam behind it endeavoring to pass it in the return main. Such a condition produces unusual and more or less mysterious troubles—the radiators on even the *second* floor may fill with water, the air valves spurt water, cracking in the pipes, fluctuation of the water line, loss of water from the boiler—later coming back with a rush and going up out of sight in the gauge glass—all this because the return is blocked with air.

If a tee is substituted for the elbow where the dry return starts to drop and a piece of ¾-in. pipe is used to extend up to good-sized air valve, placed 12 in. to 18 in. above the level of the dry return, all will be well. The air will be relieved and the condensation will flow back in a constant stream without hindrance. The exact method of doing this is illustrated in Fig. 10.

Of course, a radiator connection near the point of drop has undoubtedly saved many heating systems from trouble of this sort but where the nearest connection to the return main is, say, 15 ft. or more back of the drop, the air cannot get back to this point and find its way out through the radiator air valve.

Requirements For Radiator Humidifiers

With Description of a New Type Capable of Evaporating 2.9 Gallons Per Square Foot of Hot Water Radiator per Day.

By E. P. LYON,
University of Minnesota, Minneapolis, Minn.

In considering the efficiency of air moisteners, such as those that have come on the market during the past few years for use on radiators or in the tops of warm air furnace casings or in warm air registers, it is in order to consider what are the requirements for air moisteners in general.

We may first compare them with the human lung, for occupied houses have these natural humidifiers at work all the time. In our physiological laboratory, in cold weather, the average total evaporation (lungs and skin) of 67 students was almost exactly 2 oz. per person per hour. This would give 48 oz. or 3 lbs. or 1,360 grams per 24 hrs. The average person, therefore, contributes as much water vapor to the air as may be expected by any of the ordinary radiator humidifiers on the market, per foot of radiator.

To maintain a relative humidity of 40% (a low standard) in the writer's house, from 15 to 18 gal. of water per day must be evaporated. Calculations based on the common standard of humidity (60% to 70%), and more or less arbitrary assumptions as to the rate of leakage and renewal of air, give 15 to 30 gal. as the proper daily evaporation for maintaining humidity in an ordinary house. Bryce, of Ottawa, on the assumption of an hourly renewal of air, says 75 gal. of water per day should be evaporated.

Experiments made by the writer show that the air of his house is renewed eight or more times a day, even in quiet weather and with the fireplace flues closed. Of course, wind increases the rate of renewal. There is no outside flue in this house. The writer is convinced that, in ordinary dwellings, with a reasonable number of occupants, an outside flue for removing the air leads to waste of fuel. Moreover, it makes it more difficult to maintain humidity.

LOWER HUMIDITIES ADVOCATED.

This brings us to the question, what is reasonable humidity? In the writer's opinion, the usual standard (60% to 70%) is entirely too high for a northern home. It cannot be maintained without special mechanical devices. Although the writer's house is of good construction and has double windows, nevertheless, in sub-zero weather, a relative humidity of 50% inside the house causes disagreeable condensation on windows and on exposed outside walls, with consequent damage to wall paper, etc. There are no experimental data, so far as the writer knows, regarding optimum humidity. The injurious effects of simultaneous high temperature and high humidity are well known. But beyond the ordinary observation of chapped hands, dry skin, chilly feeling and the supposed greater prevalence of colds and respiratory disorders, we have no data as to the effects of low humidity. The furniture, rather than the human occupant, is likely to protest against an excessively low humidity in the indoor air.

In the absence of experimental data as to the optimum humidity for dwellings, let us assume that 40% to 45% is a fair standard for our northern climate. Can such a standard be maintained without special mechanical devices, involving fans, moistening chambers, etc? The writer's experience

applies only to hot water heating. Based on the principle of indirect radiation (a radiator set in the basement with air flues down and up) the writer has built a fairly adequate humidifier in his house. The air moved by this radiator passes through a chamber in which sheets to the extent of 100 sq. ft. are kept constantly wet. This surface for evaporation ought to be doubled or trebled. Otherwise the scheme works well and is automatic. Particulars concerning this apparatus will be given to anyone interested. In this article, however, it is desired to discuss only such humidifiers as can be placed on room radiators and may, therefore, be used by tenants and others who are not able to make structural changes in their dwellings.

Manufacturers of radiator humidifiers, as a rule, do not seem to realize that extent of water surfaces and the maintenance of air currents over these surfaces are more important factors in evaporation than is the temperature, under the conditions with which we have to deal. Moreover, with any wick system, it is important that distilled water be used in order to avoid the early clogging of the wick by the solids left on evaporation.

In the design of the types of radiator humidifiers here described and illustrated, the writer has attempted to avoid these errors.

Type 1 consists of a number of trays of galvanized-iron placed one above the other, being supported by vertical ends of the same material. The trays are so arranged that the current of air rising from the back of the radiator is forced over the water in the trays. This apparatus is 12 in. wide (from the wall) and 13 in. high. It should be as long as the radiator will accommodate. The trays are 18-in. higher at the back than at the front to prevent water from running over the back to the floor. The ends project in front ⅛-in. beyond the trays (except the bottom one) and the front of all the trays except the bottom one slant back and down so that the excess in filling will run into the bottom tray. This design gives 10 sq. ft. of evaporating surface for each foot of radiator occupied.

Experiments show that about ½-in. between trays gives good results and at the same time avoids excessive height of the apparatus. A model of this type, 30 in. long, with twelve trays, has evaporated 3.6 gal. a day on a hot-water radiator or about 1.4 gal. per foot of radiator. This is four or five times as effective a showing as that made by any radiator humidifier on the market, according to the writer's experience.

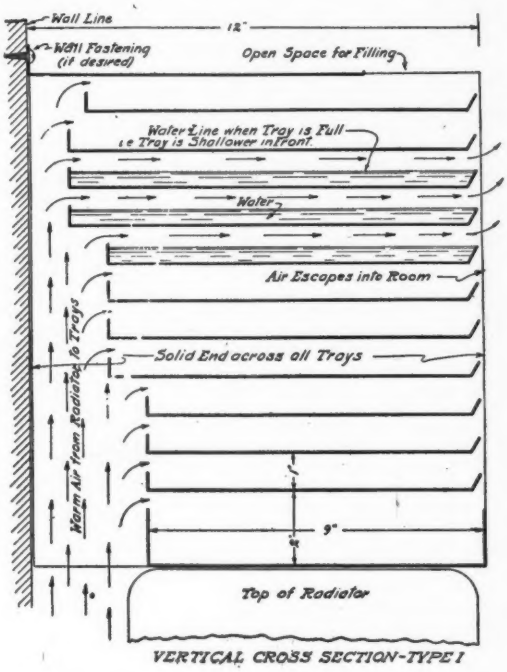


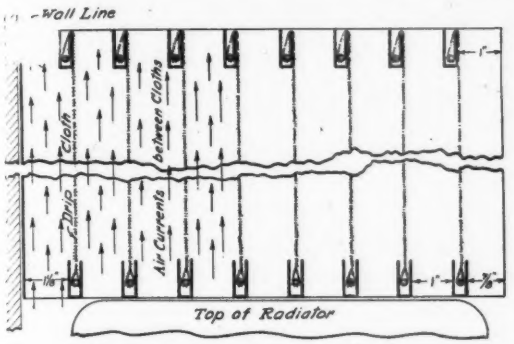
FIG. 1—RADIATOR HUMIDIFIER MADE UP OF WATER TRAYS.

This type is filled by hand and the top tray is made narrower to diminish the liability of spilling water on the floor. If the radiator in use will not support the apparatus (round topped coils) the humidifier can easily be made to hang from the wall.

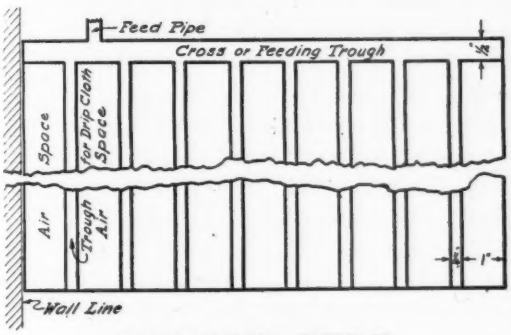
In Type 2, two series of troughs running lengthwise to the radiator are arranged so that each upper trough is vertically above a corresponding lower trough. The illustration shows a design of Type 2 with eight drip cloths. This device is 11 in. wide (from the

wall) and may be any length and height. The top troughs are ¼-in. wide and ¾-in. deep in front (where drip cloths come over) and ⅞-in. deep behind.

The center of each lower trough is vertically beneath the front edge of the corresponding upper trough. Otherwise the lower trough system is like the upper



VERTICAL CROSS SECTION - TYPE II



PLAN OF TOP - TYPE II

FIG. 2—RADIATOR HUMIDIFIER MADE WITH DRIP CLOTHS

system shown in the diagram, the run-off pipe from the lower cross trough corresponding to the feed pipe in the upper system. The evaporating surface will vary with the height and number of drip cloths used. But as both surfaces of the cloth are exposed to the air, the surface of evaporation per foot of radiator might easily be made 60-80 sq. ft.

The cloth sheet from each upper trough is suspended and kept wet by capillarity, the excess of water running off into the corresponding lower trough. The heated air rises between these suspended drip cloths and passes into the room.

Each series of troughs is connected to a corresponding trough running crosswise to the radiator. The upper cross trough may be fed with water from an inverted bottle so arranged as to maintain a constant level in the upper troughs. The excess running off from the lower troughs may be received through a rubber tube into a bottle or pail on the floor. But the frequent attention required by such a system constitutes a serious drawback. It is much better to supply a constant small stream of water from the city system and carry off the waste to the sewer. On the first floor of houses this can usually be done by boring two small holes through the floor back of and at one end of a radiator. Through these holes a small pipe may be brought up for the supply and another led down to a sink or other sewer opening for the waste. The expense is slight, the system becomes automatic, and the structural change is negligible.

As capillarity is depended on only to carry the water over the edge of the upper troughs, the cloth does not become clogged by evaporation. Each cloth is hemmed top and bottom, and a rod of galvanized iron in each hem holds the cloth flat. Old sheets were used in the model. Cheese cloth did not work well.

The vertical width of the drip cloths is important. If the sheets are very wide, the cooling effect of evaporation interferes with the air currents and lowers the efficiency; e.g., sheets 21 in. wide were not so efficient as those 14 in. wide. The optimum width for given conditions could be ascertained only by trial.

A model of this type 28 in. long and with eight evaporating surfaces 14 in. wide gave a rate of evaporation per 24 hours of 6.7 gal. (average of two tests), on a steam radiator at the University of Minnesota Medical School, and exactly the same amount (average of two tests. Jan. 14 and 15, 1917; sub-zero weather), on a hot-water radiator at the writer's house. This is 2.9 gal. per foot of radiator per day, or about ten times the effi-

ciency of any radiator humidifier found on the market.

The apparatus looks like a galvanized-iron rectangular box on top of the radiator (or hung from the wall in case the radiator coils are not flat on top). It may be painted or gilded to correspond with the radiator, or papered to correspond with the wall. Doubtless the severity of outline could be eliminated by an esthetic designer. Probably cheaper material, e.g., heavy paper, might be used for the outside covering, only the troughs being of metal.

Drying Money

By H. C. RUSSELL.

(Read at the summer meeting of The American Society of Heating and Ventilating Engineers, in Chicago, July 18-20, 1917.)

This paper is a brief description of the apparatus and methods used in the drying of paper currency at the Bureau of Engraving and Printing at Washington, D. C. As is perhaps well known, all postage stamps, United States bonds, internal revenue stamps of sundry kinds and all paper currency are printed at this Bureau which is a part of the Treasury Department. It is with the drying of the paper on which the currency is printed that this paper deals.

The printing of paper currency is, of course, the most exacting kind of printing known, and all materials must be of the very finest quality and all workmanship must be the most skillful in order that an article may be produced that will practically defy counterfeiting. To obtain the best results in fine printing the paper must be damp. It consequently follows that for the subsequent operation of finishing, the sheets must be dried, and drying must be done as rapidly as possible consistent with the quality of paper used.

The work at the Bureau is printed on comparatively small sheets, viz: 8¼ × 13½ in. for currency and 18½ × 20¾ in. for stamps. Experience had developed a system which was perhaps unique, but it gave good results. The method was to dry the paper in so-called trays, which were constructed of galvanized iron frames 1 in. deep with woven wire mesh bottoms, in which the sheets were laid horizontally, practically filling the trays in depth, 60 sheets for stamps and 60 to 80 sheets per tray for currency. When full, the trays were placed in open racks or frames, the cleats on which they rested being spaced so as to leave approximately 1 in. between the trays for the circulation of air.

The racks were placed in one large room in rows with aisles between and were open on the two sides facing the aisles. Perforated galvanized iron air pipes were run through the racks vertically with the perforations so spaced and directed that the air could pass over and under the trays. The vertical pipes were connected to a system of distributing mains communicating with an air heating chamber which was a hot blast heater provided with coils and a centrifugal fan from which the hot air was sent to all racks in the room. After performing its function of drying, the air was permitted to escape out the windows.

The dry room was open all day for the reception of work and when the presses were stopped, the room was closed and the heat turned on. The heat remained on until the attendant judged

the work to be dry, which was often quite late if the outside humidity was high. This made a very hot room for the day force to enter and remove the work next morning, quite often as much as 160 deg. On account of the various kinds of work using different weights of paper and different sizes of sheets, it was extremely difficult to so regulate temperatures and duration of heat to suit the different conditions.

The growth of the output of the Bureau was largely the reason for the crowding of the drying room, as space was not available for separate rooms for drying with individual air heating apparatus. The press rooms were in different parts of the building, but all work had to be taken to one drying room.

When the new building for the Bureau was designed, it was decided to have a drying room contiguous to each press room, which called for a total of seven drying rooms. It was also decided to still further divide the work of drying by the use of separate closed boxes or cabinets, each to be well insulated to reduce the heating up of the dry rooms in the summer to a minimum. Each of these cabinets was fitted up with individual steam coils and fans heating and forcing the air through the boxes, and as they were to be closed, a system of exhaust ducts were necessary to allow the escape of the moist air. The fans are motor driven and placed each on its own box and took its air supply from the main room, fresh air coming into the main rooms to take its place through grated transoms.

Experiments, conducted for several weeks to determine the size of the individual boxes, the amount of air necessary and its distribution, and the amount of heating surface necessary, resulted in the construction of 264 boxes like the one illustrated in Figs. 1 and 2. They are essentially closets constructed of galvanized iron, insulated with 1½ in. of hair felt, the joints riveted and bolted and made tight with wool felt. They are without bottoms and are bolted to the composition floors of the building, the joint being made tight with wool felt. The doors are double, two fold, and when closed make a tight joint with the box, each other and with the floor.

The object of the insulation and the air tight construction is to prevent the loss of heat from the boxes into the drying room so that the operations of spreading work in some boxes and drying in others may proceed simultaneously without discomfort to the attendants, who are compelled to stay in the drying room while work is being spread. Some heat is necessarily radiated into the rooms, but only a small amount of the moisture laden air escapes into the rooms; a portion of the radiated heat, however, is returned to the boxes

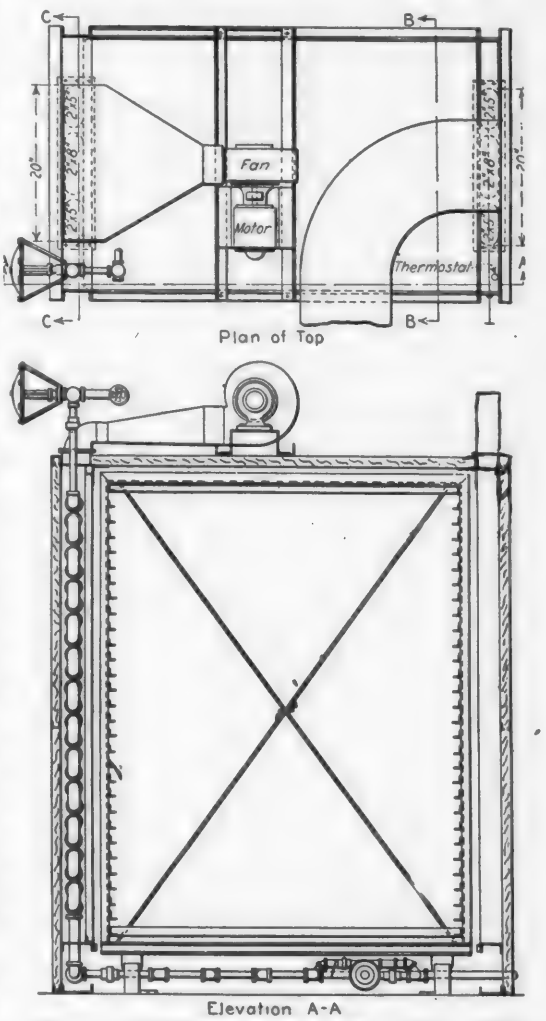


FIG. 1—INDIVIDUAL DRYING BOX, WITH FAN AND DUCTS.

through the air supply drawn from the room.

It will be seen from Figs. 1 and 2, that the fans deliver the air into the top of the box, whence it is forced downward over the coil surface and is delivered from the heating chamber into an equalizing air space, thence through a perforated diaphragm into the drying chamber, the perforations being so arranged that the air passes over and under the work in the trays arranged as in the original dry room which has been previously described. The condensation from the steam coil passes through another coil laid on the floor and is delivered through a thermostatic trap to a common condensation return main. The trap is by-passed with a connection containing a ⅜ in. needle valve.

The trays are supported on a car or truck so that if for any reason a given box cannot be heated or fails to act, the work therein may be readily transferred to another spare box.

One of the principal advantages of the new system is that any desired temperature may be maintained in any individual box, and when the work in that box is dry the heat can be cut off without affecting other boxes. After the heat is cut off, the fans can be kept running long enough to reduce the temperature of the box to a comfortable temperature before the attendants need to enter the box. This cooling also has the effect of seasoning the paper, reducing the brittleness which is sometimes the effect of too rapid drying.

One of the greatest difficulties attached to most kinds of drying, the danger of damaging the product by too rapid drying or by circulating air of too high a temperature or too low a humidity, is present in only a mild degree in drying this kind of paper.

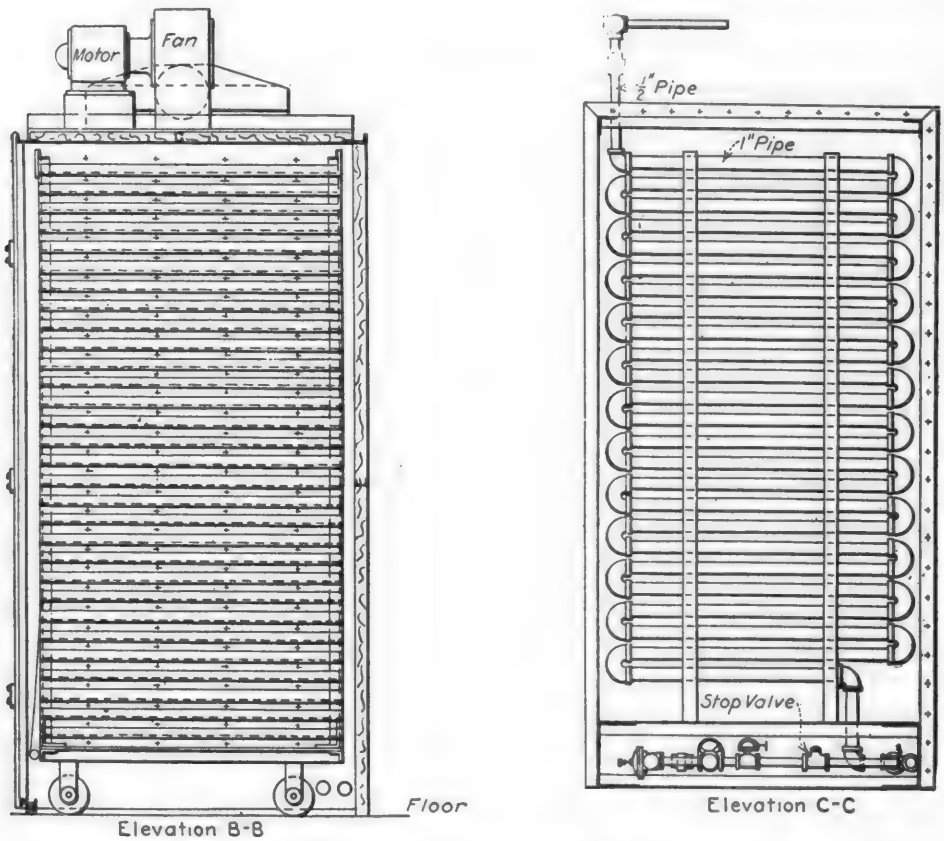
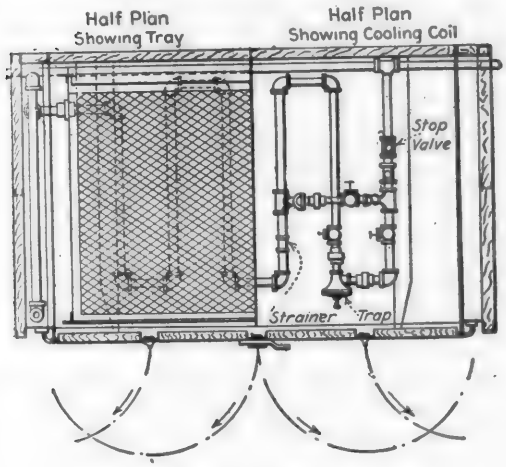


FIG.2—SECTIONS OF THE DRYING BOX, SHOWING HEATING COILS AND TRAYS.

The air supply to each box is approximately 120 cu. ft. per min. According to the temperature and humidity of the air supplied to the coils, the condensation amounts to from 10 to 12 lbs. per hour for each box. The dry rooms, which adjoin the main press rooms, were designed to hold a total of 336 boxes, of which 264 were installed, leaving a slight margin for growth.

The dry rooms were designed by George E. Reid of the Office of the Supervising Architect, which office had charge of the design and construction of the entire building. The writer is indebted to Mr. Reid for practically all



PLAN OF DRYING BOX.

the data on which this paper is based, and in fact a large part of the paper is his own verbiage.

Mr. Reid designed these dry boxes after considerable experiment in which he built a dry box and carried out his work under conditions of actual practice. This experimental work was done at considerable expense but as an answer, the dry boxes have given perfect satisfaction. They were installed by the W. G. Cornell Co., of New York, as contractors, at a cost of about $125,000.00. The boxes were built by the Buffalo Forge Co., Buffalo, N. Y., and the fans are of the Sirocco type furnished by the American Blower Co., Detroit, Mich. The thermostatic traps are of C. A. Dunham Co., manufacture.

Air Moistening Device for Warm Air Furnaces.

A novel scheme for securing the proper degree of moisture in connection with the use of a warm-air furnace has been proposed by a member of the engineering division of the Iowa State College.

A slot 4 in. long and ½ in. wide, with the long dimension horizontal, was cut near the top of the galvanized-iron furnace jacket directly over the evaporation pan. A strip of wire cloth 8 in. wide and 4 ft. long was folded lengthwise through the center. A sheet of asbestos the same size was then folded in the same way. The paper was then placed between the two layers of wire cloth and sewed in place, using a wire drawn from the edge of the cloth.

This combination strip was then slipped in the hot air chamber through the slot in the furnace casing until the lower end of the strip could be drawn into the evaporating pan near the furnace bottom. The upper end of the strip was opened for a funnel.

A connection was then made in the water pipe in the furnace room and pet cock installed in this connection just above the funnel in the upper end of the combination strip. Water allowed to drip into the funnel saturates the upper end of the asbestos strip. The length of the strip depends upon the rate of supplying water and temperature within the hot air chamber. In case water is supplied more rapidly than evaporated the excess collects in the evaporation pan below. As the weather moderates the amount of water supplied the moistening apparatus should be decreased or shut off.

In case water cannot be had in the furnace room a pail filled once a day with water can be supported by a hook placed in a floor beam above the furnace. The pail should have a hole punched in the side near the bottom and a pet cock soldered over the hole. Water can then be allowed to drip slowly through a piece of small hose into the funnel at the upper end of the asbestos strip.

A small hygrometer should be hung near a thermometer in one of the rooms. If a humidity of 30% to 40% is maintained the temperature of the room can be kept at 3° to 5° lower with more comfort than if the humidity is allowed to fall to 5% or less.

THE HEATING AND VENTILATING MAGAZINE

A Monthly Journal of Engineering Progress

Vol. 14 August, 1917 No. 8

Published Monthly at Cooperstown, N. Y., by the

Heating and Ventilating Magazine Co.

Executive and Editorial Offices, 1123 Broadway New York

A. S. ARMAGNAC ..... *President*
GUSTAVE PETERSEN.... *Secretary and Treasurer*

A. S. ARMAGNAC, Editor
GUSTAVE PETERSEN, Business Manager
HAROLD L. ALT, Contributing Editor

European Representative:
W. G. HOLLINWORTH, 304 High Holborn
London, W. C.

Subscription	$1.00 per year
Canada	1.25 " "
Foreign countries	1.50 " "
Back numbers	15 cents each
Back Nos. prior to current year	25 cents each

THOSE who have long been regular attendants at the meetings of heating engineers must be impressed by the gradual withdrawal of the old-time figures in the profession, many of whom are numbered among the leading pioneers of the art. These men witnessed practically the inception of the industry and, as a group, were contemporaneous. For years their authority was almost unquestioned and they came to be known and are still known as the "old guard" of the trade. Yet today their withdrawal from the field is nearly complete and the interesting question arises, who are to fill their places?

In spite of the tremendous advances made in the art of heating, due largely to the researches of the "old guard," it is a fact that the younger generation has been identified with the more recent advances which have been fully as important as those basic ones that established the industry. This applies to the development of vapor heating, air conditioning practice and to better means for determining ventilation requirements, as well as for fulfilling them. In these three fields a group of leaders has arisen who are rapidly forging their way to the forefront of their profession. We are undoubtedly on the threshold of still greater things in the practice of the art than we have ever known and it is both gratifying and inspiring to find the way is being paved so brilliantly by these typical American heating engineers.

ACCORDING to the present plans for the construction of the army cantonments now being built, the sleeping quarters or barracks provide for the housing of the soldiers in groups of 200. The heat supply is to be provided by stoves, with smoke flues leading through the second story. Ventilation is to be furnished by natural means through openings underneath the eaves. The prediction is now made that when cold weather comes the first thing the soldiers will do will be to close the openings admitting the cold air. But whether or not that happens, the grouping of 200 soldiers in one barrack, it is stated, is bound to have serious results on the health of the men, one authority openly predicting an epidemic of disease if this practice is followed. Both England and France, it is stated, have long since discovered the danger of thus grouping the men and today the barracks of this type are used as store-rooms and the men are sleeping outdoors in tents. It will be news to a good many that 200 men cannot be safely housed in a single sleeping quarters, but if it is true the medical profession and, incidentally, the heating profession have no time to lose to impress their views upon the proper authorities. The heating engineers' society has already done so, but it is to be hoped the matter will not stop there.

AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS

War Service the Keynote of the Summer Meeting in Chicago, July 18-20, 1917

Whole-souled loyalty to the government and an eagerness for intelligent war service distinguished the summer meeting of The American Society of Heating and Ventilating Engineers from any previous meeting. The presence of officers from the United States and Canadian armies, a representative from the Department of Agriculture and of one of the leading coal operators' associations, all with messages as to the aid heating engineers can give in winning the war, proved a most inspiring feature and one that brought home to every man present the need and opportunity for doing his "bit," whether he goes to the front or serves "behind the men behind the guns."

The army officers gave the necessary military touch to the meeting, while their addresses furnished the spark, if any was needed, to fire the enthusiasm of those present. The representative of the Department of Agriculture had some practical things to say on the subject of food drying, telling in detail of the achievements in this direction made by the Department. Visible evidence of these achievements were exhibited in the form of samples of dried food products, including potatoes, beets, beans, sweet potatoes, tomatoes, etc. The address on the coal situation covered many points that have been so widely discussed in recent months, and while presented from the standpoint of the coal operators, it gave those present a remarkable insight into the ramifications of the coal industry in the United States. Although the minimum prices on some grades of coal have been fixed in conferences with the government, it was emphasized that these prices do not include the grades ordinarily used in house heating and that prices higher than those formerly quoted must be expected next winter and for some time to come.

Delightful quarters for the meeting and registration rooms were secured on the nineteenth floor of the Hotel La Salle.

Morning Session, July 18.

F. W. Powers, president of the Illinois Chapter, welcomed the society to Chicago, the response being made by Henry G. Issertell, of New York.

President J. Irvine Lyle stated, in his address, that the summer meeting was being held in direct accordance with the government's views, which were that all commercial and technical conventions should continue to meet during the war. He said many heating engineers were already giving their services to the government and spoke particularly of the committee that was engaged in developing apparatus and designs for submarine and battleship heating and ventilation.

Mr. Lyle also spoke of the building of the sixteen huge cantonments that are being constructed for the new army and said that the figures as to materials and labor required were so large as to be hard to grasp.

In connection with the manufacture of ammunition Mr. Lyle told of the difficulties in making time fuses for shrapnel shells, which requires the most careful air conditioning. The shells, he said, must be so made that they will function within a very narrow compass after leaving the gun. He discussed the manu-

facturing requirements in detail and told of the means taken in typical instances to secure proper air conditions. (One of these installations was described in THE HEATING AND VENTILATING MAGAZINE for January, 1917.)

CHAPTER REPORTS.

Chapter reports were presented from the Illinois, Kansas City, Massachusetts, Michigan, New York, Ohio and Eastern Pennsylvania Chapters. An item of unusual interest was reported by the Kansas City Chapter which stated that it was using its efforts to have a law on heating and ventilation passed by the Kansas legislature. The proposed law provides that plans and specifications for all public school buildings must meet with the approval of a school house committee, consisting of the State architect, the secretary of the State Board of Health, and the State superintendent of schools. The chapter is also endeavoring to secure the appointment of a smoke inspector, through the mayor and council. The smoke problem has recently become an important one, due to the scarcity of gas and oil. Two members of the Chapter served on a committee to draft a boiler code for the city, and the code adopted was that proposed by the chapter.

W. M. Kingsbury, in reporting for the Ohio Chapter, told of the new code that is being drawn up for Cleveland which, if adopted, will cover the subject of heating and ventilation.

COMMITTEE REPORTS.

The matter of the establishment of a research bureau was first considered, a report on the subject being made by George W. Barr, chairman of the research bureau committee. The time has arrived, he said, for such a move. As to ways and means, he suggested that the aid of the Bureau of Standards be asked and that, if possible, a research bureau be established at the Bureau of Standards, to be under the direction of the society. Another step that the society could take is the establishment of a chair at some university which could take up research work. Mr. Barr spoke of the will of the late John Bartlett Pierce, vice-president of the American Radiator Company, which provides for the establishment of the Pierce Foundation for research work in heating and ventilation and said that he had written the executors to suggest that the proposed foundation take the form of the endowment of a chair at some university, as proposed. It was voted to continue the committee until definite information had been received as to the possibility of securing aid from the Pierce Foundation.

Professor Hoffman favored research work under the auspices of the government. In lieu of that he favored the establishment of a university chair.

The question turned, to some extent, on whether manufacturers should be asked to contribute to a research fund. President Lyle said he believed 50 firms or individuals, he did not care which, would be willing to contribute $50 a year for, say, ten years, for research work, Mr. Barr believed that anonymous contributions, as was suggested by J. A. Donnelly, might solve the question. Mr. Collamore thought every member of the society should have a share in the proposed research work, and for that reason he advocated a raising of the dues, although he would not refuse additional contributions.

Prof. S. E. Giesecke said the difficulty in establishing a chair would be that no one man could undertake the many investigations that are needed, but if a research bureau were established it could obtain the co-operation of many of the educational institutions.

For the committee on engineering co-operation John F. Hale, chairman, recommended that the proceedings of the National Association of Engineers be published in the next issue of the Journal so that the members could get a better idea of its objects and purposes, and could then determine how far the so-

DINNER TENDERED THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS BY THE ILLINOIS CHAPTER, AT THE CHICAGO YACHT CLUB, JULY 18, 1917.

ciety should participate in this work.

Professor John R. Allen presented the report of the special committee on "Standard Method for Testing Radiators." Professor Allen stated that he had been making radiator tests with electricity as the heating medium and that he would have a detailed report to present at the next annual meeting, comparing this method with the usual method of heating the radiators from an outside source.

For the committee on "Standard Method of Testing Air Washers," E. A. Stacey told of the results accomplished by the Chicago Commission on Ventilation in making dust counts, commenting especially on the successful use of the Hill dust counter designed by Dr. E. Vernon Hill (described in THE HEATING AND VENTILATING MAGAZINE for June, 1917).

The report on "School House Standards" by F. I. Cooper, chairman, was read by Secretary C. W. Obert. It took up the matters of standard forms and measurements which would permit comparisons as to costs of units, and minimum sizes of classrooms and toilet rooms. Mr. Cooper's report was a lengthy one and covered in detail the steps that have already been taken in this direction by other organizations.

A report governing the issuance of chapter charters was presented by F. R. Still, chairman, containing a uniform type of charter. It met with the approval of the meeting.

COMMITTEE TO CO-OPERATE WITH THE NATIONAL DISTRICT HEATING ASSOCIATION.

President Lyle gave an account of the meeting, May 21, at the society headquarters in New York, at which representatives of the National District Heating Association met with representatives of the heating engineers' society. The points discussed included the appointment of committees to outline what research work should be conducted by each association and to see that both societies are working in co-operation; also the programme committees of each body should confer to see that there is no duplication in the matter of papers, etc. Finally, it was suggested that both organizations arrange to hold their meetings at the same place, the district heating engineers to take up the first three days with the commercial topics of interest to the central station heating engineers, and the last part of the week to be devoted to the engineering side of heating and ventilation, including district heating.

The suggestions made were heartily approved by the meeting. President Lyle appointed a committee to co-operate with the National District Heating Association and it was decided to have the so-called "joint" meeting, if possible, the third week in June, 1918.

Regarding the annual meeting of the society, President Lyle explained that the third week in January would hereafter be a very crowded one at the Engineering Societies Building, owing to the fact that the civil engineers now have their headquarters in that building and meet at that time. It was voted to approve the council's plan to advance the date of the next annual meeting to probably the first week in January.

F. E. McCreary then presented the first paper on the programme, on "Hot Water Heating System of the Crane Company Plant," in Chicago.

Military Session, July 18.

Scheduled as a military session, the first speaker Wednesday afternoon was Captain O. N. Solbert, U. S. A., Corps of Engineers, who spoke on "The Engineer in War." Captain Solbert said that modern warfare has become an engineering proposition. If it were merely a question of soldier power, Germany would have won the war long ago. But supplies count for as much as soldiers and the men at home are doing just as much service in winning the war by helping to keep up the stream of

ammunition and supplies, as the men at the front.

The internal combustion engine, said Captain Solbert, is the biggest individual factor that has changed the character of modern warfare. This applies to the operation of aeroplanes, submarines as well as vast numbers of motor cars used in military service.

The big element in the work of the military engineer is the time factor. Speed is everything, no matter at what cost. This is the big difference between the military engineer and the engineer in civil life.

Captain Solbert gave some idea of the vast needs of military operations by stating that one mile of front line trenches usually requires 900 miles of barbed wire, 2,650,000 sand bags, 12,000 staves and pickets, 36,000 square feet of corrugated iron, and 1,250,000 lineal feet of lumber.

The present cost of the war, he said, to all of the belligerents, is no less than $100,000,000 per day.

Captain Solbert gave an interesting account of the formation and work of the military arm of the service, taking a division as a basis, for a division, he said, is the smallest independent organization which is complete, with infantry, cavalry, engineers, signal corps, artillery, and hospital service.

Nine regiments of engineers, said Captain Solbert, were leaving the United States that day (July 18) for service in France.

Every man in the country, he said, who has had an engineering education may have his part in the war. It is not so glorious a part, perhaps, as that of the soldier, but it is every bit as important a part.

As Captain Solbert concluded his address he was given an ovation and on motion of Homer Addams, he was given a rising vote of thanks, with further prolonged applause.

In introducing the next speaker President Lyle stated that he did not remember that either the United States government or any other government had ever until now given recognition to the heating engineers' society. But in sending the next speaker, Lieut.-Col. T. E. Powers, of the Canadian forces, to address the society, the Canadian government had conferred a notable honor on the society.

Lieutenant-Colonel Powell won the Distinguished Service Order at the Battle of the Somme and his account of trench life was extremely vivid. At first he said the trenches were inadequately constructed, with only crude arrangements for drainage. This applied also to shelter dugouts, which had no adequate means for their heating and ventilation.

It was soon discovered that drainage must be given more consideration. It became the practice to construct the dugouts at a depth of 30 to 40 ft., and capable of accommodating from 200 to 2,000 men each.

For heating purposes in the front lines biscuit tins and similar receptacles are used with charcoal as the usual fuel.

One of the principal uses which the British army makes of the air shafts in German dugouts is to drop bombs down them, said the officer. On the whole there is little application of scientific heating and ventilation methods at the front.

Colonel Powell was given an equally enthusiastic reception, and a rising vote of thanks, on motion of F. R. Still.

A telegram of greeting was received from Frank T. Chapman who was unable to be present.

The concluding paper of the military session was one on "The Ventilation of Barracks," by W. J. Mauer. Mr. Mauer's paper first dwelt on the subject of the lack of ventilation at the front, as a result of which 200,000 French soldiers alone have been invalided with tuberculosis.

He then gave a list of specifications which should be followed in the construction of barracks. He said the temperature should be maintained at from 45° to 50° F., except when the temperature is 10° below zero, when the bar-

racks temperature should be 40° above that figure.

He said the proper means of heating such buildings was from a central heating station.

Each of the barracks being built for the new army cantonments is two stories high with accommodations for 200 men. Four stoves will be installed on the first floor of each barrack and the stove pipes led through the second story to give some heating effect on that floor. The construction, it is calculated, will keep the CO_2 content at 12½ parts in 10,000. The Chicago Commission on Ventilation has secured permission to make air tests in some of the barracks during the coming winter.

Mr. Still stated that the barracks he had seen in England recently were made of corrugated iron. No provisions were made for heating them, although the past winter was the worst in 50 years in England.

Mr. Mauer was asked about the government order for 12,000,000 sq. ft. of direct radiation, but it was stated that no information is available as yet on this matter.

Dr. William N. Evans stated that, in his opinion, the grouping of men in such sleeping quarters as were proposed was a dangerous mistake and that if the present type of barracks is constructed and used as planned, we shall be confronted next winter with epidemics among the enlisted men of cerebro-spinal meningitis, typhoid and consumption. He spoke of the experience of England which resulted in turning the men out of the barracks and having them live in tents.

H. M. Hart offered a motion that a committee be appointed to report before the present meeting adjourned, with a view of crystallizing the opinion of the meeting and advising the War Department as to the conclusions reached.

After discussion this motion was passed and the chair appointed H. M. Hart and W. F. Verner as a committee to take up the matter, with Dr. William N. Evans to serve ex-officio.

THE CANTONMENT RESOLUTION.

This committee reported at the final session with a resolution stating that since the grouping of soldiers in buildings, holding as many as 200 each, had been attended with dangerous results in England and France and had been condemned by many experienced medical authorities, the society strongly suggested a change in the plans of the barracks at the new army cantonments, if not too late, with a view of securing more healthful conditions in dormitories and offered to place the services of its members at the disposal of the government in re-designing the barracks.

The resolution was generally supported and upon adoption was ordered to be sent to the War Department by telegraph.

President T. I. Lyle presented a paper which was the joint work of D. D. Kimball, A. K. Ohmes and himself, entitled "Notes on the Testing of Heating and Ventilating Equipment."

Notes on the Testing of Heating and Ventilating Equipment.

This paper was an effort to furnish the basis for a code of standard testing methods. As was pointed out there are at present no codes in existence for certain classes of appliances. The paper was divided into two parts, the first being devoted to testing methods and apparata, and the second to mechanics of heating and ventilation. Under testing methods and apparata numerous points were given for measuring room temperatures, room and outside observations, duct temperatures, water or liquid temperatures; and for using recording thermometers, sling psychrometers, hygrometer and hygrodeik, recording hygrometers, barometers and CO_2 determinations, with general instructions for use of CO_2 instruments; also for making dust and bacteria determinations, volumetric air

measurements, conditions of pressures existing in a duct conveying air, air movement determinations, etc. The second part of the paper, "Mechanics of Heating and Ventilation," outlined standard practice for steam, hot water, warm air and gas heating. Under humidifying a new type of direct humidifier was included, and directions given for the use of both the "head" type of humidifier, spraying water directly into the air, and the central type which is in general use. Cooling systems were also discussed, with notes on direct and indirect cooling. For dust and fume removal the rules of the New York State Department of Labor, Industrial Board, are recommended for general application.

Mr. Still highly commended the paper, stating that it was of great importance to secure means of establishing 100% efficiency as we know it. The code as outlined might not be complete but it was an important step towards a standard. On motion of Dr. E. Vernon Hill it was voted to appoint a committee on "standard instruments and methods of making tests." The committee will take the paper submitted by Messrs. Lyle, Kimball and Ohmes as a basis.

As one of the government speakers, Mr. H. C. Gore, of the Department of Agriculture, could not arrive until Thursday, the paper by F. E. Giesecke, on "The Friction of Water in Iron Pipes and Elbows" was presented at this session.

The Function of Water in Iron Pipes and Elbows.

This paper gave the results of tests made at the University of Texas last November to determine the friction of cold water in standard American pipes and fittings. The apparatus consisted essentially of two tanks connected by a pipe line containing the pipes or elbows to be tested, and the necessary devices for measuring the velocity of the water and the friction-head. Several charts were included and a formula developed applying to water at about 68° F. flowing through clean iron pipes ranging in size from ½ in. to 3 in. and at velocities up to 3 ft. per second. This formula is as follows:

$$h = 0.00685 \frac{v^{1.77}}{v^{1.275}}$$

Where h = friction-head in feet and v = velocity in feet per second. A modified formula was also given for galvanized pipes based on similar tests. Experiments made to determine the effect of temperature on the friction, with water at temperatures varying from 70° to 140° F. was used. It was found that the friction decreases as the temperature increases. By comparing the expression for the friction in 1 ft. of pipe with that for the friction in one elbow, the number of feet of pipe equivalent in frirtion to one elbow may be found for any velocity of flow. This was done and the results were shown in chart form.

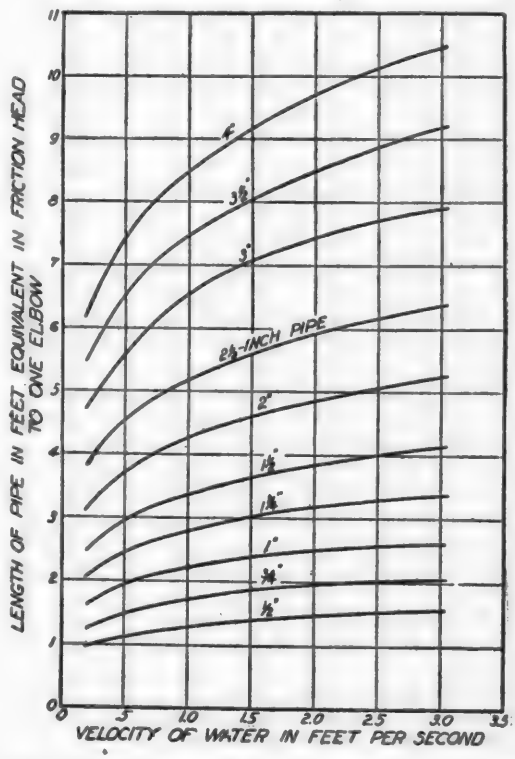


DIAGRAM SHOWING RELATIONS BETWEEN FRICTIONS IN ELBOWS AND STRAIGHT PIPES, FOR DIFFERENT VELOCITIES.

Recent German experiments have been made especially for application to the design of hot water heating systems, but they resulted in two distinct and different formulas, one being $h = 0.0049 \frac{v^{1.84}}{d^{1.26}}$ for pipes with screwed couplings and not larger than about 2 in. diameter and the other $h = 0.0069 \frac{v^{1.80}}{d^{1.37}}$ for pipes with flanged couplings and not smaller than about 2 in. diameter.

These two formulas differ materially from each other and the question arose, is each one applicable to standard American pipe, and if so, which one? These considerations led to the conclusion that we need more data on the friction of water in pipes and that the need justified the cost of a series of experiments.

In the tests as made by Professor Giesecke the friction in an elbow was found to vary much less uniformly with the diameter of the pipe than the friction in 1 ft. of pipe. This, he said, is due, no doubt, largely to the fact that the friction of an elbow depends upon the depth to which the pipe is screwed into the elbow, upon the relative size of the internal diameter of the elbow as compared with that of the pipe and upon the radius of the elbow, and that these values do not vary uniformly with the diameter of the pipe.

In answer to inquiries, Professor Giesecke stated that the formula most commonly used for determining the friction of water in iron pipes is

$$h = f \frac{l}{d} \frac{v^2}{2g}$$

In this formula f is a factor which must be determined by experiment and which varies with the velocity of the water and with the diameter and character of the pipe. American research to determine values of f has given particular attention to the higher velocities of water and to the larger pipe sizes generally used in ordinary hydraulic work, and, for that reason, the published values of may not be sufficiently accurate for the very low velocities and for the small pipe sizes frequently employed in hot water heating.

Drying Session, July 19

The drying session was opened with an address by H. C. Gore, a chemist in the Department of Agriculture in Washington, who has had a long experience in the drying of fruits, vegetables.

Mr. Gore said there was at present no market in this country for dried vegetables, and garden produce generally. There is such a market in Europe.

The drying methods he described were obtained by ordinary electric fans blowing air over trays filled with cut vegetables and fruits.

Mr. Gore stated that the art of drying is so old that no one need to fear infringing existing patents in taking up this work. It was scarcely possible, he said, that any apparatus developed would involve principles that could be called new.

A question as to whether quick or slow drying affects the flavor of the dried products was answered by the statement that ordinarily there would be no marked difference.

The discussion also brought out the fact that there is no loss of flavor in the drying process.

In Germany, said Mr. Gore, a portion of the garbage is now being dried and fed to cattle, coming back in the form of milk. Potatoes, he said, have to be cooked before being dried.

As to analyzing the chemical combinations which make up flavors, Mr. Gore stated that experiments were now being conducted along this line with grapes. A large part of the sweet potato crop rots before reaching the market and this crop could be easily dried and preserved by the method described.

Large quantities of sweet corn are already dried each year and make an excellent dish.

The ordinary drying process, it was brought out, will operate at 50% efficiency, and from this it may easily be determined what the cost will be, given the cost of coal and the fact that 100 lbs. of steam will evaporate approximately 50 lbs. of water.

As to cutting the product in small pieces before drying, there are two opinions on that. For quick drying and where the electric fan process is used, the shredding is necessary as the whole vegetable is well protected by nature against losing moisture. Some of the western drying concerns, said Mr. Gore, prefer drying larger pieces, making the time element longer.

Mr. Gore said that in New York they were using the school ovens in the public school buildings for drying work, and that an opportunity was at hand for the heating and ventilating engineers to develop this idea throughout the country in school buildings equipped with mechanical heating and ventilating systems. Mr. Fleisher described a simple temporary apparatus that could be used for this purpose, especially as during the summer time school plants are usually idle.

If drying is done in wooden houses with heated air, recirculated, there will be sufficient inleakage of moisture to keep the relative humidity fairly low.

F. R. Still then presented a paper on the subject "Dehydrating Fruits and Vegetables."

(This paper will be published in a later issue.)

Mr. Still stated that in Japan they dry almost all food products. He thought there was a big opportunity in this country for developing the drying of food but that it is necessary to educate the public to the quality of dried foods.

Case hardening in drying work, he said, is due to too high a temperature of the air. This temperature should be immediately lowered, and the air velocity kept up.

In the absence of the authors, the papers by C. R. Shadwell on "The Preservation of Food Products by Drying," and by Walter M. Schwartz on "Drying of Fruits and Vegetables," were read by Secretary Obert.

The Preservation of Food Products by Drying.

This paper was devoted principally to drying methods with gas heaters. A gas-heated portable smoke house for curing hams, bacon, sausages, etc., was shown, as well as an arrangement for blowing air through the heater and thence through a dry room. Very few organic materials, the author stated will undergo decomposition or putrefaction without the aid of some foreign agency. They may lose water, and some oleaginous substances may change by oxidization, but otherwise they are stable unless attacked by living organisms. The fact that few adult bacteria can live beyond 165° F. in the presence of water, although dry heat alone only kills with certainty at about 285° F. is an important point in connection with drying by heating. The author gave some practical hints on the preservation of meats, vegetables and fruits by the process described.

Drying of Fruits and Vegetables.

This paper discussed the Proctor system of drying which consists essentially of moving a large volume of air at a low temperature over and through the products to be dried. Approximate figures were given of the saving in shipping vegetables in a dry state, as compared with the cost of shipping in the whole form. In a typical case 100 bushels of sweet potatoes would dry to about 55 bushels, whereby a saving of $103 would be realized, or about 45% in the shipping cost. Again, 100 bushels of red beets are re-

duced to 10.8 bushels in bulk. The saving in shipments per 100 bushels is $204.20, or 89%. Two types of these driers were mentioned, the 3-apron automatic type, for handling large quantities of different kinds of vegetables and the tray dryer type for handling relatively small quantities.

President Lyle said the papers presented made it conclusive that fruits and vegetables could be successfully dried, but that more information would be welcome as to just what methods are used with the most success. At the request of the chair, Mr. Edwards, of the B. F. Sturtevant Company, gave a detailed account of the work done in a commercial way on the Pacific coast by the Ever-Fresh Fruit Company of Oregon.

Mr. Edward said he believed many firms were going into the drying game in the near future and he described in detail the experience gained by the Ever-Fresh Fruit Company.

A paper on "Mechanical Curing of Alfalfa" by E. M. Bassler, was read by Secretary Obert.

Mechanical Curing of Alfalfa.

In this paper Mr. Bassler, who is an engineer with the Bayley Mfg. Co., described an apparatus which, he stated, was exceedingly simple and inexpensive, because the entire cost of the drying operation, including the cost of grinding, is less than the cost of baling ordinary fluid-cured alfalfa. The apparatus consists of a long sheet-metal cover about 200 ft. in length, 10 ft. wide and 10 ft. high, fitted with a conveyor, and supplied with air from a fan blast apparatus. This type of dryer, he stated, will be made use of for drying fruits. The most economical size seems to be one which will evaporate 10,000 lbs. of water per hour from the green product. In drying alfalfa in a plant of this kind, the author evaporated 9,800 lbs. of water per hour with a steam consumption of 8,400 lbs. per hour. The total cost of producing a ton of pea green alfalfa, taken direct from the field, carrying 69% of moisture, evaporated down to 11% in the finished product, was 83 cents per ton, based on coal at $4.25 per ton delivered.

An additional illustration was shown of a typical alfalfa drying plant capable of taking care of 1,000 acres.

The paper on "Drying Money" by H. C. Russell was read by C. R. Bradbury.

(This paper is published on another page of this issue.)

Mr. Fleisher presented a resolution asking that the Department of Agriculture make an appropriation for the establishment of demonstrating stations to show the advantages of drying food products, inasmuch as there is at present no market for such products. This resolution was adopted and will be forwarded to the Department of Agriculture.

For the committee on code for testing low pressure heating boilers, Homer Addams reported progress and stated that the committee expected to have a final report in shape for the next annual meeting. He said the committee had considered all of the points brought up at the last annual meeting and urged that the members send in additional written discussions based on the report published in the April Journal.

The committee, it was brought out, has advanced so far with its work that it will be prepared to have a complete boiler code ready for adoption at the annual meeting.

Morning Session, July 20.

Arthur K. Ohmes read a paper at the opening of the Friday morning session on "A Study in Air Measurements and Air Flow."

A Study in Air Measurements and Air Flow.

Details are presented in this paper of experiments made to determine the amount of air passing through certain small channels under very slight pressure differences. These pressure differences conformed to wind velocities

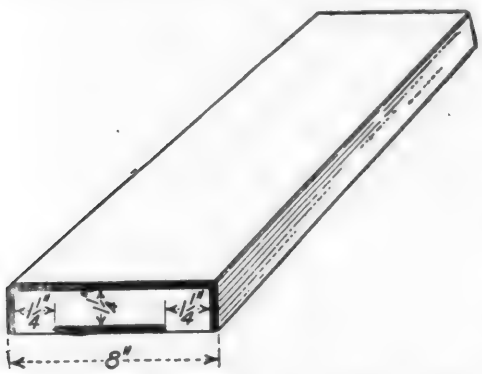
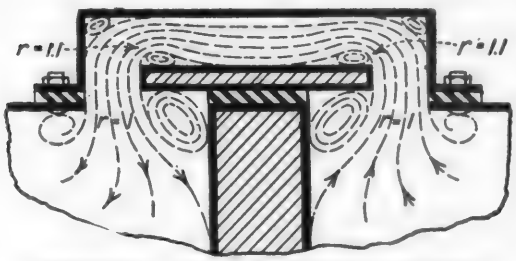
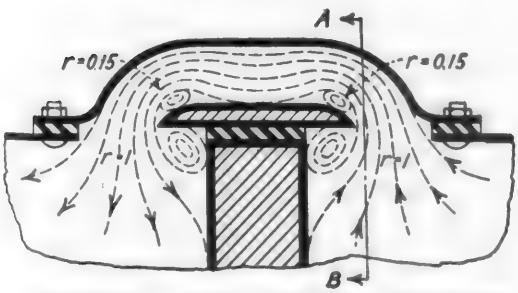


FIG. 1—DETAIL OF THE SQUARE CHANNEL.

of from 5 to 12 miles per hour, with the air temperature at 75° F. and 60% relative humidity. The velocity pressures under these conditions would then vary from 0.012 to 0.068 of water



SECTIONAL VIEW THROUGH SQUARE CHANNEL.



SECTIONAL VIEW THROUGH ROUNDED CHANNEL.

column. The illustration shows the general contour of the channels. As was to be expected the rounded channel required considerably less power to drive a certain amount of air through it. A comparison, however, made to compare the actual test results with the accepted theories, disclosed the fact that the theoretical resistances are greater than accurate testing results indicate them to be. The tests show what fairly complete means are available for engineers in conducting tests.

In discussing the paper Mr. Still stated that as ventilating installations get larger and larger we are finding losses that we cannot account for and we need just such investigations as the one described to give us the needed data.

DISCUSSION OF COAL SITUATION.

At this point the fuel problem facing the country was taken up, the subject being opened with an address on "The Fuel Problem in the United States," by F. C. Honnold, secretary-treasurer of the Illinois Coal Operators' Committee and a member of the Coal Producers' Committee of the Illinois State Defense Committee.

At the present time, he said, the coal problem is mainly one of transportation. If the railroads could furnish the requisite number of cards, he said, the situation would soon relieve itself. The situation would have been even more serious if a ruling had not been made by some of the State Utility Commissions that coal be considered an iron product and given preferential shipment. This ruling, he said, has not been so closely followed of late, as it might have been.

He said the operators have made up about one-third of the coal shortage, but with the heating season only ten weeks off, the situation is sufficiently grave.

Regarding prices to be charged, he

spoke of the agreements entered into by the operators at the recent Washington conference, and said the prices set by the government of $3.50 maximum per ton, would be faithfully observed. Frankly, however, he warned his hearers that householders and others who were looking to a further reduction in prices were doomed to disappointment.

The reduction in coal prices, agreed upon with the government affects only a small proportion of the total amount of coal produced.

One of the elements affecting the price of coal is the matter of idle days at the mine. The average cost to the operators of such idle days is $500 per day.

One of the speakers referred to a possible relaxation of the smoke laws, as had been proposed, but stated that the smoke ordinances were one of the most important measures that could be taken to conserve the fuel supply.

Secretary D. L. Gaskill of the National District Heating Association was the next speaker, his address being devoted to co-operation between the district heating engineers and members of the American society.

He gave details of the work of the Educational Committee of the N. D. H. A. and showed how the heating engineers' society had not kept pace with the National District Heating Association in this work. He made definite proposals for closer co-operation through the work of a joint committee, and heartily endorsed the movement for a "joint" meeting of the two associations.

Dr. E. V. Hill presented a paper on "Ventilation Standards and the Synthetic Air Chart."

Ventilation Standards and the Synthetic Air Chart.

In this paper the author, Dr. E. Vernon Hill, emphasized the point that the problem in ventilation is not so much how to accomplish the desired end, but how to know when that end is accomplished. In other words we must have a standard of ventilation. Dr. Hill then described the development of the synthetic air chart (published in THE HEATING AND VENTILATING MAGAZINE for March, 1917) and how by its use the Chicago Division of Ventilation is able to adjust the relations of temperature, humidity and air motion so as to secure comfortable and healthful conditions. A description was also given of the experimental room at the plant of the Cameron-Schroth Co., which was placed at the disposal of the Chicago Commission on Ventilation.

Before proceeding with the discussion President Lyle abstracted the paper of George T. Palmer on "Are School Rooms Drier than Deserts?" and both were discussed at the same time.

Are Schoolrooms Drier than Deserts?

The point of Mr. Palmer's paper was that air does not necessarily feel dry just because of its low relative humidity. If the feeling of dryness is the result of the removal of water by evaporation, there is no reason, from the standpoint of physics, for expecting a feeling of dryness solely because the relative humidity is low. Mr. Palmer went into the physics of evaporation to prove his point. His conclusions were supported by tests made with the atmometer and Kata-thermometer, the results of which show that the sensation of dryness seems to be associated with the rate of water loss, the quantity, and the adequacy of the replacement process. Schoolrooms admittedly dry, he said, do not appear to be as dangerous to health as deserts. One reason is that schoolroom air does not extract as much moisture from wet objects nor from the human body as desert air.

Mr. Ohmes said that while standards might be established for the winter months, they would not apply to summer weather when people wear lighter clothes and eat less. He expressed the hope that Dr. Hill would make it plain that the standards as proposed in his paper apply specifically to Chicago, as different standards would apply in other sections of the country, the environment being the deciding factor.

Mr. Blackmore called attention to the fact that no standards exist in Nature and that the human anatomy is intended to be subjected to varying conditions.

Mr. Lyle said that the rate of air change will make a great difference in the matter of comfort, so that excessive humidities or temperatures can often be made comfortable by rapid air movement. This is a factor that would have to be taken into consideration in using the "comfort zone" charts.

Mr. Gaskill said that the National District Heating Association was prepared to take the stand that indoor temperatures in this country are too high. The difficulty in thus expressing itself lay in the fact that the public would immediately jump to the conclusion that the district heating companies were working purely from a self-interest standpoint.

Dr. Hill said there was a best air condition in nature and cited the cures of tuberculosis effected in the Alps through the application of radiant heat from the sun, under practically uniform conditions.

F. A. De Boos presented a paper on "Operation of Diaphragm Radiator Valves, Thermostatically Controlled." (This paper was published in the April, 1917, issue of the society's Journal.)

As it was desired to bring the meeting to a close with this session, three of the remaining papers were read by abstract, these being a paper on "Mine Ventilation," by J. J. Walsh; one on "Warm Air Furnace Heating," by I. F. Grumbein; and one on "Use of Refrigeration in Air Conditioning," by L. Nusbaum.

Mine Ventilation.

This paper, written by a mine inspector of the Tenth Anthracite Inspection District was a practical discussion of working conditions with pointers on location of fans, booster fans and design of fan capacity for mine ventilation.

The cantonment resolution was then brought up and adopted, as already stated. While on the subject of military matters, President Lyle stated while many of the members were well able to sacrifice their time and money in government war service, still he thought some provision should be made for meeting the expenses of war committees so that there would be no danger of being deprived of any member's services on the ground of expense.

WAR DEFENSE FUND STARTED.

President Lyle's suggestion was eagerly taken up and it was voted to appoint a war defense fund committee to obtain contributions for the express purpose of meeting the expenses of those members who are or who will be called upon to confer and co-operate with the government bureaus. President Lyle gave it as his belief that no more loyal organization can be found than the heating engineers' society and that enough contributions can be secured averaging from $5.00 to $10.00 per member to meet any expenses that are likely to be incurred.

A resolution of thanks to the Illinois Chapter for its royal hospitality and to the chapter's entertainment committee, of which J. A. Cutler, was chairman, was adopted with enthusiasm and President Lyle took advantage of the opportunity to express his own appreciation, and that of the other offi-

cers, for the splendid manner in which the Illinois Chapter had handled the meeting.

It was stated that the paper by J. E. Emswiler on "Measurements of Low Pressure Steam Used for Heating," which were made at the Universtiy of Michigan, would be held over, on account of the lateness of the hour, until the next annual meeting in January.

The meeting then adjourned.

Illinois Chapter Proves Royal Host.

Plans made by the Illinois Chapter for the entertainment of its guests were arranged and carried out on a scale that easily surpassed those of any previous meeting and those who attended last year's summer meeting, in Detroit, will understand that Chicago had to step lively to accomplish this.

The two big events were the dinner and dance at the Chicago Yacht Club and the dinner and garden party at the Bismarck Garden. The former was held on the opening night, Wednesday, and latter on the following evening. These, however, formed only a part of the programme, being interspersed with a luncheon party Wednesday noon for the ladies in the Blue Fountain Room of the Hotel La Salle, followed by an automobile sight-seeing trip through Chicago's extensive and beautiful park system. In the meantime the men met for luncheon in the convention hall on the 19th floor of the hotel.

In the evening special automobiles were provided to take the party to and from the Chicago Yacht Club. The clubhouse, on the water front of Lake Michigan proved a most delightful spot after the comparative heat of the city while the view took in not only a wide expanse of the lake but also showed in the foreground several naval boats, including one of the training ships. Covers were laid for fully 200 members and guests, an unusually large number of ladies being present to grace the party.

The speaker of the evening was Lieut.-Col. T. E. Powell of the Canadian Army, who held the close attention of the diners while he told them of the part women were playing in the war, both in France near the front and in England and Canada. Dancing followed in the club's ball room and continued till a late hour.

Thursday morning was taken up with a trip for all, by automobiles to the Corwith plant of Crane Company, where an inspection was made of the extensive hot water heating system installed at this plant. This system, which was the subject of a paper presented by F. E. McCreary at the opening session, is probably the most extensive in existence. Guides met the members of the party on their arrival and conducted them in groups through the plant, many braving the high temperatures of the pipe tunnels extending 1,000 ft. or more to inspect this part of the installation.

The same evening the entire party was taken, again by automobiles, to the Bismarck Garden, the route lying through Lincoln Park, along the lake front. Here an even larger number were gathered than on the preceding evening. Dinner was served outdoors with reflection illuminating the entire garden, presenting a scene of unusual beauty and color. After dinner the party strolled through the garden in groups to the strains of the band music, taking in the dancing in the outdoor pavilion and adjourning later to the Mosaic Room, where an elaborate cabaret performance was staged.

Friday afternoon, after the final adjournment, the golfers at the convention had their party. A special bus was provided to take the players to the Edgewater Golf Club, where some thirty players competed for prizes put up by the entertainment committee. The competition was an 18-hole medal play handicap, each player to fix his own handicap, the winning score to be a figure between 70 and 80, chosen by lot. The figure drawn was 76, giving the first prize, a pair of golf shoes, to A. S. Armagnac, whose score was 91-15, 76.

While a large number of the Illinois Chapter members was on hand throughout the meeting to entertain its guests, the committee in direct charge of the entertainment was composed of J. A. Cutler, chairman; E. J. Claffey, August Kehm and Benj. Nelson, all of whom came in for hearty congratulations on the splendid success of their efforts.

CENTRAL STATION HEATING

Importance of Supervising Piping in Customers' Buildings

By D. E. KARN.

Consumers' Power Company, Grand Rapids, Mich.

In this age of high coal prices, with economy as the main issue, it is well to remember that the convenience of operation from a district heating plant is an economic advantage. And in order that we may be of assistance to the consumers in assuring them satisfactory and economic operation from the central station, there must be perfect co-operation.

This co-operation should exist primarily between the producer and consumer; second, complete co-operation should exist between the district heating company, the architect and the steam fitter. A customer is helpless in regulating his steam consumption satisfactorily in so far as his ideas are concerned, if the heating system has not been properly designed and installed. Heating engineers, inexperienced with operating conditions from central station service, very often design plants which are not adapted to those conditions.

In order to eliminate these differences which may exist, the district heating company should have in its employ, an engineer who could either design for the customer or assist the architect in designing a system best adapted to local conditions. Then, too, during the course of installation he should have the power, as inspector, and be authorized to suggest such changes, during construction, as would be necessary for the betterment of the heating plant. This would place the entire responsibility for the installation of a perfect system, with the utility company. There it rightfully belongs, since the company desires to insure the customer of economical operation and satisfactory service.

SUPERVISION ESPECIALLY NECESSARY WITH ATMOSPHERIC AND VAPOR SYSTEMS.

It is now, perhaps, even more important that the utility company have supervision of piping in customers buildings, since the advent of the atmospheric and vapor systems of heating. The Atmospheric system of heating differs quite largely from the old style one or two-pipe installations, due to the fact that a much lower pressure is maintained in the piping. That necessarily reduces the velocity of flow. With the velocity decreased it is essential that the sizes of supply mains and risers be increased, thus permitting the required volume of steam to be carried to the heating units. The return piping, being free from any pressure other than atmospheric, must have the proper size and slope in order that perfect drainage of the system may exist.

The chief source of faulty installations arises from the fact that the steam fitter uses his personal knowledge and experience of former years, and disregards the ample pipe sizes and proper slope of mains, necessary with the Atmospheric system. Then, too, it is important that the district heating company have direct supervision to

protect the owner against either unscrupulous or ignorant steam fitters.

A TYPICAL INCIDENT.

The following incidents relative to a certain Atmospheric installation will demonstrate the results of lack of co-operation:

The radiation had been figured by a reliable boiler company, and figured amply strong, but the steam fitter was allowed to use his own discretion as to pipe sizes. He ran ¾ in. supply risers to the second floor radiators and in some cases used 1 in. arms about 15 ft. long without dripping them, and with very little fall. He also used ½ in. return risers and in some cases even used ½ in. return mains. In addition to this it developed that in a great many cases the pipes were not reamed at all after being cut off with a three-wheel cutter. The result being that the second floor radiators did not heat at all and the first floor radiators gave very indifferent service.

The contract also called for a drip trap on the end of the service. The steam fitter convinced the customer that this drip trap was entirely unnecessary, but failed to make any allowance in the contract price for same.

When this job was completed, as the customer supposed, the steam fitter collected his money. Several weeks later, when the steam was turned on, it was found that there was no receiving tank on the system. Meanwhile, the steam fitter had gone out of business and another fitter was secured who put in the receiving tank, but who charged $50.00 for his work. The job did not work satisfactorily and the utility company, probably out of deference to the steam fitter, failed to notify the customer as to the cause of the trouble or to prescribe a remedy. Even with sufficient radiation and good pressure on the line, several times it was necessary for the customer to fire his hot air furnace, which luckily had not been removed.

Many such instances as that stated above occur daily, in buildings connected to district heating companies' systems where the companies do not give personal supervision to the installation of customers' piping, and show the necessity of co-operation between the utility company, the consumer, the engineer and the steam fitter in order that a system may be economically installed and operated and the convenience of an "up-to-date" system, supplied from central station service, enjoyed.

VALUE OF ENGINEERING RESEARCH DEPARTMENTS.

The best results have been obtained by companies who maintain an extensive engineering research department, the duties of which are three fold:

FIRST: To do research work, making tests of various specialties, devices and heating systems.

SECOND: To design plans and make specifications for customers' heating systems, embodying recommendations resulting from the various tests. The district heating company is best fitted to design an economical system for any particular condition. This also relieves the architect of the responsibility and in some cases the necessity of obtaining an engineer to do the work, and at the same time collect his commission on the contract. The owner is freed from the difficult task of choosing a satisfactory heating system from a number of plans submitted by various engineers. He perhaps is not capable of choosing from the merits of each, but rather is influenced by the cash value attached.

THIRD: To have direct supervision of installation of customers' piping. As a result of this, piping of the proper size and slope will be installed and insure a good circulation of steam which is the chief requisite for the up-build-

ing of a satisfied customer. This method of inspection also protects the reliable steam fitter, who bases his contract price on a fair installation according to the plans, against the unscrupulous fitter who, without an inspector over him, would place a low bid and during construction disregard the plans and specifications, thus saving money wherever possible.

In localities where the above system of supervision exists, it meets with the hearty approval of the heating contractor and steam fitter, since it relieves them of all after responsibilities. When the work has once been accepted by the district heating company and the owner, the steam fitter is not subject to return calls for making repairs, which in general, are the result of ordinary usage. This is an item of great saving to the contractor, due to the fact, that they are called upon time and again, to virtually maintain a system during the first heating season after installation.

The results and benefits of this system are far reaching and effective, since through co-operation, satisfactory service is guaranteed which in turn, will extend the mains from the district heating plant.

District Heating Companies in the United States

One of the features of the recent convention of the National District Heating Association was the exhibit of a map of the United States, showing all of the district heating companies, with symbols to indicate whether they are steam plants or hot water plants. The map also indicates the states in which district heating is under the control of state utility commissions.

H. C. Kimbrough, Western manager for the American District Steam Company, is the compiler of the map which, it is stated, is up-to-date in every particular.

STATES HAVING COMMISSION CONTROL.

It was shown that the states having commission control for district heating are:

California.
Connecticut.
Idaho.
Illinois.
Indiana.
Kansas.
Maryland.
Massachusetts.
Missouri.
Montana.
Nevada.
New Hampshire.
New Jersey.
New York.
Ohio.
Oklahoma.
Oregon.
Pennsylvania.
Rhode Island.
Vermont.
Virginia.
West Virginia.
Wisconsin.

There are in all no less than 401 central station heating plants shown on the map, 351 of which are steam and 50 hot water. They are distributed as follows:

It should be noted that the plants listed include many installations that supply heat to more than one building, but which are not strictly district heating systems. As it was difficult, in some instances to draw the line, they have all been included.—EDITOR.

Alabama
  Birmingham (s.)
Arkansas
  Little Rock (s.)
California
  Oakland (s.)
  San Diego, 2 (s.)
  San Francisco, 3 (s.)
Colorado
  Boulder (s.)
  Colorado Springs (s.)
  Denver, 3 (s.)
  Idaho Springs (s.)
  Lamar (s.)
  Pueblo (s.)
  Walzenburg (s.)
Connecticut
  Bristol (s.)
  New Haven (s.)
  Unionville (s.)
Georgia
  Atlanta (s.)
Idaho
  Boise (h. w.)
  Heyburn (s.)
Illinois
  Alton (h. w.)
  Aurora (s.)
  Belvidere (h. w.)
  Bloomington (s.)
  Canton (s.)
  Carrollton (s.)
  Champaign (s.)
  Charleston (s.)
  Chicago (s.)
  Clinton (s.)
  De Kalb (s.)
  Danville (s.)
  Decatur (s.)
  Evanston (h. w.)
  Galva (s.)
  Galesburg (s.)
  Hillsboro (s.)
  Jerseyville (s.)
  Kewanee (s.)
  Matoon (s.)
  Monmouth (s.)
  Morrisonville (s.)
  Mt. Vernon (h. w.)
  Mt. Carmel (h. w.)
  Oak Park (h. w.)
  Pana (s.)
  Paris (h. w.)
  Paxton (s.)
  Pekin (s.)
  Peoria (s.)
  Pontiac (s.)
  Quincy (s.)
  Rockford (s.)
  Springfield (h. w.)

Streator (s.)
Sycamore (s.)
Taylorville (s.)
Tuscola (s.)
Urbana (s.)
Virden (s.)
Watseka (h. w.)
Waukegan (h. w.)

Indiana
Alexandria (h. w.)
Amo (s.)
Anderson (s.)
Batesville (s.)
Bedford (h. w.)
Bloomington (s.)
Boonville (h. w.)
Brazil (s.)
Connersville (s.)
Crawfordsville (h. w.)
East Chicago (s.)
Elwood (h. w.)
Evansville (s.)
Fowler (h. w.)
Frankfort (h. w.)
Huntington (s.)
Indianapolis, 2 (s.)
Kokomo (s.)
La Porte (h. w.)
Lafayete (h. w.)
Lebanon (h. w.)
Logansport (s.)
Marion (h. w.)
Martinsville (s.)
Mooresville (h.w.)
Muncie (s.)
New Castle (s.)
Noblesville (s.)
Peru (h. w.)
Princeton (h. w.)
Rochester (s.)
Shelbyville (s.)
South Bend (s.)
Terre Haute (h. w.)

Iowa
Ackley (s.)
Albia (s.)
Bedford (s.)
Boone (h. w.)
Britt (s.)
Burlington (s.)
Carroll (h. w.)
Cedar Rapids (s.)
Centerville (s.)
Clarinda (s.)
Cresco (h. w.)
Des Moines (s.)
Dubuque (s.)
Eagle Grove (s.)
Eldora (s.)
Grinnell (s.)
Grundy Ctr. (s.)
Hampton (s.)
Ida Grove (h. w.)
Iowa Falls (h. w.)
Lamoni (s.)
Leon (s.)
Manchester (s.)
Marion (s.)
Mason City (h. w.)
Missouri Valley (s.)
Oskaloosa (h. w.)
Ottumwa (s.)
Perry (h. w.)
Red Oak (h. w.)
Shenandoah (s.)
Sidney (s.)
Sioux City (s.)
Spirit Lake (s.)
Story City (s.)
Traer (s.)
Vinton (s.)
Webster City (s.)

Kansas
Fort Scott (s.)
Leavenworth (s.)
McPherson (s.)
Sabetha (s.)
Salina (s.)
Topeka (s.)
Wichita (s.)
Wilson (s.)

Kentucky
Jenkins (s.)
Louisville (s.)
Paducah (s.)

Maryland
Baltimore (s.)
Cumberland (s.)
Port Deposit (s.)

Massachusetts
Boston, 3 (s.)
Lynn (s.)
Pittsfield (s.)
Springfield (s.)
Westfield (s.)
Worcester (s.)

Michigan
Adrian (s.)
Battle Creek (s.)
Decatur (s.)
Detroit (s.)
Grand Rapids, 2 (s.)
Houghton (s.)
Lansing (s.)
Virginia (s.)
Wadena (s.)
Winthrop (s.)

Missouri
Excelsior Springs (s.)
Kansas City, 2 (s.)
Kirksville (h. w.)
Maryville (s.)
Mexico (s.)
St. Joseph (s.)
St. Louis (s.)
Sedalia (s.)
Springfield (s.)

Montana
Billings (s.)
Butte (s.)
Glendive (s.)
Havre (s.)
Miles City (s.)
Missoula (s.)

Nebraska
Auburn (s.)
Arlington (s.)
Aurora (s.)
Chadron (s.)
Clay Center (s.)
Crawford (s.)
Geneva (s.)
Harvard (s.)
Lincoln, 2 (s.)
McCook (s.)
Norfolk (s.)
O'Neill (s.)
Scottsbluff (s.)
Sidney (s.)
Wilber (s.)
Wisner (s.)
York (s.)

New Hampshire
Exeter (s.)
Nashua (s.)

New Jersey
Atlantic City

New York
Auburn, 2 (s.)
Brooklyn (s.)
Clifton Spgs. (s.)
Dunkirk (s.)
Fredonia (s.)
Garden City (s.)
Geneva (s.)
Hilton (s.)
Hornell (s.)
Ithaca (s.)
Lockport (s.)
Newark (s.)
Newburgh (s.)
New York, 2 (s.)
Niagara Falls (s.)
Orangeburg (s.)
Penn Yan (s.)
Port Jefferson (s.)
Poughkeepsie (s.)
Rochester (s.)
Troy (s.)
Waterville (s.)

North Dakota
Bismarck (s.)
Dickinson (s.)
Enderlin (s.)
Fargo (s.)
Grand Forks (s.)
Jamestown (s.)
Kenmare (s.)
Langdon (s.)
Mandan (s.)
Minot (s.)

Ohio
Ada (s.)
Barberton (s.)
Bowling Green (h. w.)
Canton (s.)
Cincinnati, 2 (s.)
Cleveland, 3 (s.)
Columbus (h. w.)
Coshocton (h. w.)
Dayton, 2 (s.)
Delavare (h. w.)
Elyria (s.)
Fremont (h. w.)
Leipsic (s.)
Lima (s.)
Miami City (h. w.)
Middletown (h.w.)
New Philadelphia (s.)
Oberlin (s.)
Ottawa (s.)
Piqua (h. w.)
Springfield (s.)
Tiffin (s.)
Toledo, 3 (h. w.)
Troy (s.)
Washington Court House (h. w.)
Youngstown (s.)

Oregon
Dallas (s.)
Portland (s.)

Pennsylvania
Allentown (s.)
Altoona (s.)
Bangor (s.)
Bloomsburg (s.)
Bolivar (s.)
Cambridge (s.)
Chester (s.)
Clearfield (s.)
Coatesville (s.)
Bellefonte (s.)
Easton (s.)
Ebensburg (s.)
Erie, 2 (s.)
Germantown (s.)
Gettysburg (s.)
Grenville (s.)
Hanover (s.)
Harrisburg (s.)
Hazleton (s.)
Holmesburg (s.)
Johnstown (s.)
Lebanon (s.)
Lincoln (s.)
Lock Haven, 2 (s.)
Mt. Pleasant (s.)
Mahanoy City (s.)
Meyersdale (s.)
Montrose (s.)
Norristown (s.)
Overbrook (s.)
Oxford (s.)
Philadelphia, 2 (s.)
Pittsburgh, 3 (s.)
Philipsburg (s.)
Pottsville (s.)
Reading (s.)
Renova (s.)
Scranton, 2 (s.)
Shenandoah (s.)
Spring Grove (s.)
Towanda (s.)
Tyrone (s.)
Vandergrift (s.)
Washington (s.)
Wayne (s.)
West Chester (s.)
White Haven (s.)
Wilkes-Barre (s.)
Wilkinsburg (s.)
Williamsport (s.)
Windber (s.)
York (s.)

Rhode Island
Pawtucket (s.)

Providence (s.)
South Dakota
Brooklings (s.)
Mobridge (s.)
Rapid City (s.)
Virginia
Clifton Forge (s.)
Utah
Salt Lake City (s.)
Virginia
Clifton Forge (s.)
Washington
North Yakima (s.)
Seattle (s.)
Spokane (s.)
Tacoma (s.)
Lapeer (s.)
Sault Ste. Marie (s.)
Saginaw (s.)
Minnesota
Ada (s.)
Albert Lea (h. w.)
Alexandria (s.)
Buhl (s.)
Canby (s.)
Crookston (s.)
Detroit (s.)
Duluth (s.)
Eveleth (s.)
Glenwood (s.)
Hibbing (s.)
Jordan (s.)
Keewatin (s.)
Mapleton (s.)
Marshall (s.)
Minneapolis, 2 (s.)
New Ulm (s.)
Mora (s.)
Owatonna (h. w.)
St. Paul, 3 (s.)
Springfield (s.)
Staples (s.)
Wisconsin
Beaver Dam (s.)
Berlin (s.)
Burlington (s.)
Hartford (s.)
Kenosha (h. w.)
La Crosse (h. w.)
Milwaukee, 5 (s.)
Mineral Point (s.)
Sturgeon Bay (s.)
Waukesha (s.)
West Bend (s.)
Wyoming
Casper (s.)
Cheyenne (s.)
Evanston (s.)
Laramie (s.)
Canada
Berlin (s.)
Brandon (s.)
Chatham (s.)
Dundas (s.)
Kingston (s.)
London (s.)
Montreal (s.)
Toronto (s.)
Winnipeg (s.)

The Care of a Vacuum Heating System in the Summer Months

By H. S.

Many operating engineers in plants where vacuum heating systems are used are under the impression that a vacuum system does not need attention such as is required by the ordinary steam system during the off season, acting on the theory that because there is a vacuum on the system, all obstacles will thereby be overcome. However, a vacuum heating system requires a thorough looking over in the summer months, in order to keep it in the proper condition for efficiency and economical operation.

The most important point is to look over each return valve on the coils and radiators. They should be thoroughly cleaned by going around to each one, removing the interior and washing it off with hot water and soap or kerosene, to remove all grease and foreign matter which collect during the heating season. If the valves are of the thermostatic or expansion type, or float valves, they should be examined closely to ascertain if any of the containers or floats are cracked. If so, they should be replaced by new ones. These can usually be obtained from the manufacturers as they are nearly always guaranteed for five years' service.

All foreign matter should also be removed from the seat of the valve at the same time. The dirt pockets at the return header on the coils on loop seals and under differential valves should be thoroughly cleaned out. Remove all the foreign matter from the strainer at the vacuum pump and from any strainer at other points in the system—on Vento stacks, pipe coil heaters or on branch returns.

Pack all valve stems on the radiators and coils and particularly the valves on the returns and at the vacuum pump. Pack all flanges on the main return and install new gaskets or unions on the return mains.

The vacuum pump should have a thorough overhauling. The pistons should be examined, new packing installed and the valves reground. Any other points where air might leak in should be carefully examined.

Wherever vacuum systems are used in connection with street steam service, the service company should insist upon its customers taking care of any of the foregoing details for which they are responsible. The service company should also be very particular to see that all points in the main return where air might leak in, such as expansion joints, flanges, valves, etc., are carefully overhauled.

Current Heating and Ventilating Literature.

Under this heading is published each month an index to the important articles on the subject of heating and ventilation that have appeared in the columns of our contemporaries. Copies of any of the journals containing the article mentioned may be obtained from THE HEATING AND VENTILATING MAGAZINE *on receipt of the stated price.*

COMBINATION SYSTEM

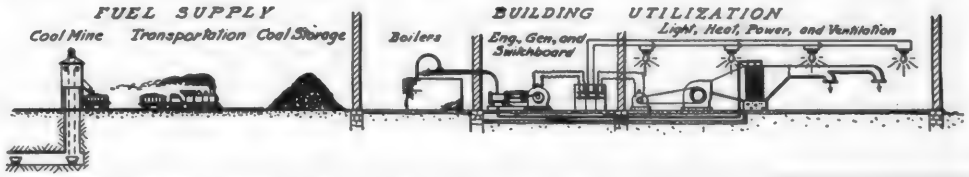
Combining Power, Heating and Ventilation. Ira S. Evans. Ills. 4,000 w. Power—May 22, 1917. Serial, 1st part. Comparison of the usual blower system and a combination system. 20c.

POWER PLANTS

Telephone and Telegraph Building Steam Power Plant. Warren O. Rogers. Ills. 2,000 w. Power—May 8, 1917. Office-building plant having features out of the ordinary. 20c.

Air Moistener Co., Chicago, Ill., has appointed J. W. McAfee, consulting engineer, New York, as its sole selling agent for the eastern and southern states. Mr. McAfee will be glad to forward catalogues and quote trade discounts to the heating and ventilating trade. His headquarters are at 645 West 171st St., New York.

POWER PLANT ENGINEERING



Data for Selecting and Installing Power Boilers

Horizontal return tubular boilers are usually set in a brick setting with a fire wall, but without baffles. The products of combustion, created by burning coal on the grate, pass under the boiler shell to the rear, then forward through the tubes in the boiler shell to the front smoke box and out of the uptake into the chimney. A standard brick setting is shown in Fig. 1, this being used for all H. R. T. boilers by one of the most prominent engineering concerns and shows a setting which is guaranteed to prove satisfactory.

To provide for expansion of the boiler in the setting the front brackets are set on a bearing plate, but the rear brackets are placed upon rollers; a distance of 1 in. is then left between the rear of the shell and the brickwork.

When conditions render such a feature desirable it is entirely practical to arrange the setting of H. R. T. boilers with the smoke uptake located in the rear. This is accomplished by arranging another pass for the gases along the top of the boiler toward the rear, this pass being formed by arching the setting across the shell about 9 in. above the top and supporting the boiler by hangers from cross beams carried transversely over the top of the setting. This, in fact, is the method used and recommended by the Lukens Iron & Steel Co., one of the oldest tubular boiler manufacturers in the country.

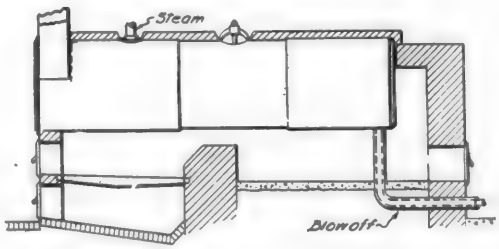


FIG 1. STANDARD BRICK SETTING.

THICKNESSES OF BOILER SHELLS FOR VARIOUS PRESSURES.

Diam. of Shell Inches	Thickness of Shell Inches	Allowable Working Pressures, Gauge, in Pounds per Square Inch, with Various Rivetings of Longitudinal Seams		
		Single	Double Staggered	Double Triple Butt Joint
42	9/32	84	103	
	5/16	93	114	
48	0.32	83	102	126
	0.36	94	115	141
54	0.36	83	102	126
	3/8	86	106	131
60	0.40	83	102	126
	0.42	87	107	132
66	0.43	81	100	123
	0.45	85	105	129
72	0.45	78	96	118
	0.48	83	102	126
78	0.45	72	88	109
	0.50	80	98	121
84	0.45	67	82	101
	0.50	74	91	112

REQUIRED THICKNESS OF METAL.

To compute the required thickness of shell for any given pressure the formula used is that for the rupture of cylinders subjected to interval pressure, viz.:

$$X\% \text{ of } t = \frac{P \times R}{S}$$ to which is added about

⅛ in. for corrosion and deterioration.

When t = the required thickness in inches.

R = the radius of the shell in inches.

P = the working pressure in pounds per square inch (guage).

S = the allowable stress in the metal in pounds per square inch (tensile strength ÷ 5 for factor of safety).

X% = the probable efficiency of the riveted joint, use 57% for single riveting, 70% for double staggered riveting, 86% for triple riveting.

The heads are usually made from plate 1/16 in. thicker so that a 48-in. boiler triple riveted at 100 lbs. working pressure would be computed as follows:

$$0.86\ t = \frac{100 \times 24}{11{,}000}$$

HORSEPOWER OF H. R. T. BOILERS.

Dia. of Shell, In.	Tubes Size, In.	Tubes No.	Length Ft.	Heating Surface, Sq. Ft.	H. P.
42	3	34	8	253	25.3
	3	34	9	284	28.4
	3	34	10	314	31.4
	3	34	11	344	34.4
	3	34	12	374	37.4
	3	34	13	405	40.5
	3	34	14	435	43.5
	3	34	15	465	46.5
	3	34	16	495	49.5
48	3	50	12	526	52.6
	3	50	13	569	56.9
	3	50	14	612	61.2
	3	50	15	654	65.4
	3	50	16	697	69.7
	3	50	17	740	74.0
	3	50	18	782	78.2
54	3	62	14	749	74.9
	3	62	15	801	80.1
	3	62	16	840	84.0
	3	62	17	905	90.5
	3	62	18	958	95.8
	3	62	19	1010	101.0
	3	62	20	1062	106.2
60	3	72	14	866	86.6
	3	72	15	927	92.7
	3	72	16	987	98.7
	3	72	17	1047	104.7
	3	72	18	1108	110.8
	3	72	19	1168	116.8
	3	72	20	1228	122.8
66	3	98	14	1146	114.6
	3	98	15	1236	123.6
	3	98	16	1306	130.6
	3	98	17	1386	138.6
	3	98	18	1466	146.6
	3	98	19	1546	154.6
	3	98	20	1627	162.7
	3	98	21	1707	170.7
	3	98	22	1787	178.7
72	3	124	14	1427	142.7
	3	124	15	1527	152.7
	3	124	16	1626	162.6
	3	124	17	1726	172.6
	3	124	18	1826	182.6
	3	124	19	1926	192.6
	3	124	20	2025	202.5
	3	124	21	2125	212.5
	3	124	22	2225	222.5

$$T = \frac{100 \times 24}{0.86 \times 11{,}000} = \frac{1}{4} \text{ in. which, with}$$

⅛ in. added, gives a ⅜ in. shell and a ⅜ in. + 1/16 in. or 7/16 in. head.

The city of Philadelphia requires the thickness of shell shown on page 50 for various pressures with 55,000 lbs. tensile strength of steel.

The bracing of the heads is accomplished by the expanding of the tubes into the lower portion and by rods or diagonal braces above the tubes. The matter of bracing is often left to the manufacturer with the stipulation of the working pressure and a test pressure of 25% in excess of the working pressure.

SIZES AND RATINGS.

In rating horsepowers for H. R. T. boilers it is conservative to allow 10 sq. ft. of heating surface per horsepower, heating surface being all the surface of the boilers with water or steam on one side and the fire or gases of combustion on the other. In the H. R. T boiler this consists of the area of the tubes, front and rear heads and the lower half of the outside of the shell.

The table on page 51 gives the horsepower for various sizes of H. R. T. boilers.

H. R. T. boilers are sometimes set with the smoke box overhanging at the front. Such an arrangement is not desirable as it hinders the fireman in his work close to the fire and ash doors. The blow-off pipe is taken from the rear of the boiler and carried out of the setting by passing through the space in which the gases are travelling. This pipe should be protected from the excessive heat and action of the gases by a baffle or covering of substantial sort; a special asbestos sleeve is manufactured for this particular purpose.

Where the steam is taken off of the boiler a dry pipe will give the best results, this consisting of two pieces of perforated pipe one size smaller than the steam nozzle and extended two or three feet along the inside of the shell as close to the top as possible. Sometimes a baffle plate is placed below the pipe to prevent water being drawn up into it.

PORTABLE STEEL FIRE BOX BOILERS.

A fire-box tubular boiler of the portable type is shown in Fig. 2. The feed water enters this type through the flange in the water leg at the rear of the fire box and just above the ash pit. It gradually ascends in the boiler as it becomes heated, finally becoming vaporized and passing out through the steam nozzle. Based on 10 sq. ft. of heating surface per horsepower the following dimensions cover the various sizes:

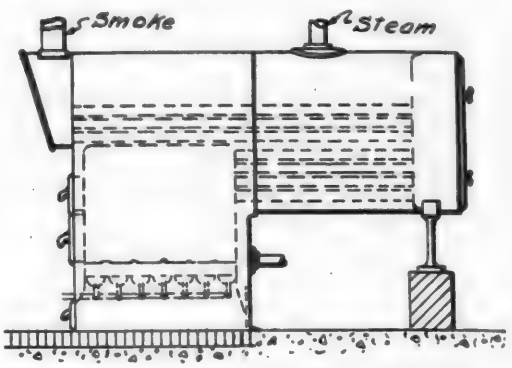


FIG. 2—PORTABLE FIRE-BOX TUBULAR BOILER.

HORSEPOWER OF PORTABLE STEEL BOILERS.

Diam. of Boiler In.	Length of Boiler	Width of Boiler	Heating Surface Sq. Ft.	Horse-power
30	5′–5″	2′–6″	75	7.5
	6′–5″	"	89	8.9
36	5′–11″	3′–0″	118	11.8
	6′–5″	"	128	12.8
	7′–0″	"	146	14.6
42	6′–8″	3′–6″	187	18.7
	7′–8″	"	219	21.9
	8′–7″	"	248	24.8
48	8′–3″	4′–0″	281	28
	9′–2″	"	320	32
	10′–9″	"	375	38
54	9′–8″	4′–6″	422	42
	10′–9″	"	477	48
	11′–9″	"	528	53
60	12′–1″	5′–0″	583	58
	13′–3″	"	642	64
	14′–0″	6′–8″	701	70
	15′–10″	"	804	80
66	15′–5″	7′–2″	905	90
	17′–0″	"	1003	100
72	15′–7″	7′–8″	1202	120
	17′–2″	"	1234	123

BRICKSET STEEL FIREBOX BOILERS.

Another type of fire box boiler which is brick set is shown in Fig. 3, the smoke outlet being on the rear in this case. Here all the gases pass through the tubes to the rear smoke box but do not return toward the front through tubes, travelling instead on the outside of the shell along the lower half for the length of the baffle located approximately on the center line of the boiler and extending front almost to the rear of the fire box. Passing around the end of the baffle the gases travel toward the rear again along the top of

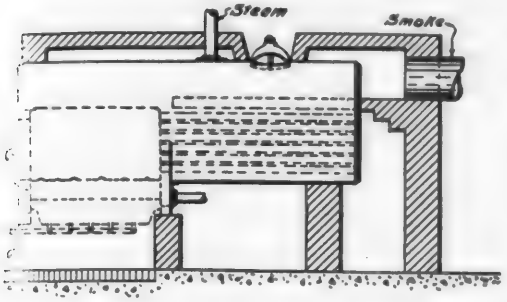


FIG. 3—BRICKSET FIREBOX BOILER, WITH SMOKE OUTLET AT THE REAR.

the shell (between the arched top of the setting and the shell) to the smoke outlet.

HORSEPOWER OF BRICK-SET FIREBOX TUBULAR STEEL BOILERS.

Diam. of Boiler, In.	Length Overall	Width of Boiler	Horsepower
30	6′–6″	5′–7″	7.5
	7′–6″	"	8.3
	8′–6″	"	10
36	7′–6″	6′–1″	12
	9′–0″	"	14
	10′–6″	"	18
42	8′–6″	6′–7″	19
	10′–0″	"	21
	11′–6″	"	24
48	10′–6″	7′–2″	27
	12′–0″	"	32
	13′–6″	"	37
54	14′–0″	7′–8″	41
	16′–6″	"	49
60	15′–6″	8′–2″	60
	18′–0″	"	71
66	16′–0″	9′–0″	78
	18′–0″	"	88
72	16′–0″	10′–0″	93
	18′–0″	10′–0″	107

WATER-TUBE BOILERS.

Water-tube boilers may be of the more common type with a longitudinal drum as shown in Fig. 4 or may be of the cross drum style as illustrated in Fig. 5. In these boilers

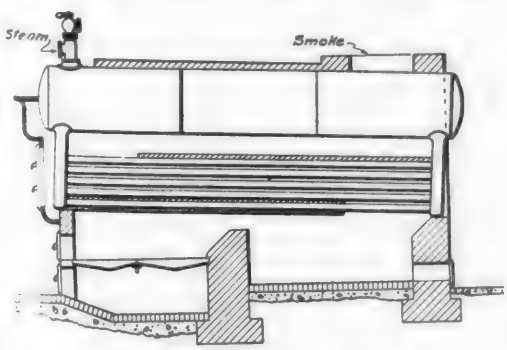


FIG. 4—WATER-TUBE BOILER WITH LONGITUDINAL DRUM.

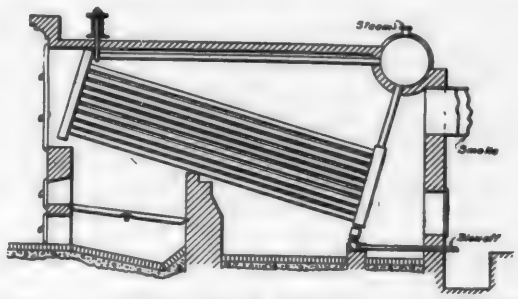


FIG. 5—WATER-TUBE BOILER OF CROSS DRUM TYPE.

the gases traverse across the tubes several times being guided by fire-brick baffles laid on the tubes.

The horsepower of longitudinal drum boilers runs approximately as follows:

HORSEPOWER OF WATER-TUBE BOILERS.

(Longitudinal Drums.)

Length of Boiler	Width of Boiler	No. of Tubes	Horsepower
16′–6″	7′–0″	46	66
"	7′–0″	59	83
20′–6″	7′–7″	53	100
"	7′–7″	68	125
"	8′–2″	77	167
18′–6″	8′–2″	94	150
20′–6″	8′–9″	86	155
"	8′–9″	105	187
"	9′–4″	95	170
"	9′–4″	116	205
"	9′–11″	104	187
"	9′–11″	127	225
"	10′–6″	138	250
"	10′–6″	163	286
"	11′–1″	149	249
"	11′–1″	176	308

Cross-drum boilers occupy slightly less space than the longitudinal drum type their dimensions for equivalent horsepowers being 6 in. to 12 in. less than the above lengths and widths.

BLOWOFF CONNECTIONS.

In providing for the blowoff on high pressure boilers additional safeguards are needed; the most approved practice demands a plug cock next to the boiler, then the regular blowoff valve and then a check valve between the blowoff valve and the blowoff header;

this is illustrated in Fig. 6. The purpose of the plug cock is to allow the blowoff valve to be repaired without shutting down the boiler and it is sometimes used as an auxiliary shut-off, being kept closed continuously except during the time of blowing down the boilers. The check valve serves as a double purpose, as it allows the blowoff valve to be repaired without interfering with the use of the blow-off main by other boilers and it prevents scalding a man inside of a boiler cut out for repairs and upon which the blowoff had been

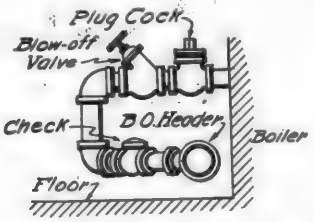


FIG. 6—APPROVED PRACTICE FOR BLOW-OFF CONNECTION.

left open—a thing otherwise very likely to occur.

Regardless of the size of the boiler the blowoff connection is seldom more than 2½ in. in size. Good practice requires the connection of the blowoffs from a battery of boilers into a 3 in. or 4 in. header through Y branches, the header terminating in a cast-iron or steel blowoff tank which is vented and where the heated water has a chance to cool before going into the drain to the sewer. The overflow to the sewer is taken from the bottom of the tank so as to secure the coolest water, all as shown in Fig. 7 which is a typical blowoff tank with its connections.

The size of the blowoff tank may be roughly checked by figuring its capacity so as to re-

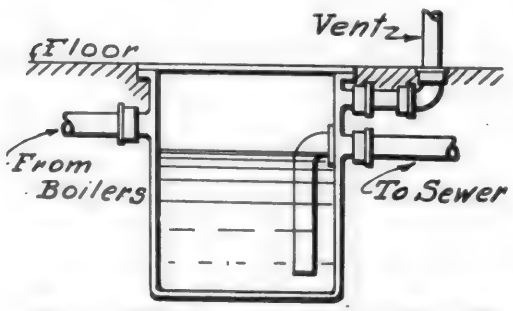


FIG. 7—TYPICAL BLOWOFF TANK AND CONNECTIONS.

tain all the water delivered when a boiler is blown down 3 in. below its previous water line.

Some localities require the use of a cooling coil in a blowoff tank, the idea being that the fireman will turn on the cold water before blowing down and thus cool the boiler water. In reality such coils do little good as they are seldom operated properly.

The boiler horsepower required in a building power plant where the exhaust is used to heat the building is not necessarily determined by the maximum horsepower developed. Neither is it wholly determined by the heating load. The boilers must have capacity enough to carry the maximum power load or the maximum heating load, the greater demand being the one to actually consider in developing the neces-

NEW POWER PLANT OF THE DETROIT EDISON COMPANY.

sary boiler capacity. Whenever the heating requirements are less than the amount of steam furnished by the engine exhaust, a make-up of high-pressure live steam direct from the boilers must be used, the pressure being reduced by passing it through a reducing valve, but when the heating load is less than the amount of exhaust steam supplied by the engine the surplus steam must escape through a back-pressure valve and free exhaust to the atmosphere.

Detroit, Mich.—The accompanying illustration shows the new power plant of the Detroit Edison Company, at Connor's Creek, Detroit. It is claimed for this building that in construction and equipment it surpasses any other building of its kind in the United States or abroad.

The War and the Heating Engineer

National Committee Appointed on Health of Employees.

An important movement has been inaugurated by the National Defense Advisory Council in appointing a committee on the health of employees, with Dr. William A. Evans, of Chicago, as chairman. A section of this committee will be devoted to industrial hygiene, with Dr. E. R. Hayhurst as chairman. One of the sub-committee of the industrial hygiene section will devote itself to ventilation, including heating. The members of this sub-committee are Professor C. E. A. Winslow, D. D. Kimball and Rudolph Herring. This and the other subcommittees are to submit both standards and recommendations (for the time being essentials only) covering the subject assigned to it and to arrange to conform to the following:

1. Items so vital that they should be embodied in contracts which the government makes with manufacturers or others.

2. Items of second importance, to be brought to the attention of manufacturers, and in some instance to laborers, also eventually to be made laws, these to be transmitted within one month.

3. Items of third importance, to be made the subject of educational propaganda, to be transmitted at a more subsequent date.

The general order of application of standards and recommendations to be, first, for those industries making high explosives, next arms and ammunitions, next heavy war machinery, and thereafter other industries engaged less directly in the military preparations, and eventually, possibly to all industries.

Heating Men in Military Service.

A partial list has been compiled by *Domestic Engineering*, Chicago, of men engaged in the heating and plumbing trades who are now in the National Guard, either as officers or privates, or who may be called upon to serve Uncle Sam in the war with Germany. Among these are the following:

Adjutant-General William T. McGurrin, of the heating and plumbing firm of Sproul & McGurrin, Grand Rapids, Mich., who has seen many years of service with the Michigan National Guard.

Major Edward Bittel, 1st Regiment, Illinois National Guard, formerly a heating and plumbing contractor in Chicago.

Major William H. Chenoweth, manager of the Chicago branch of Warren Webster & Co., serving with the Illinois National Guard.

Captain Robert H. Smith, a Chicago heating and plumbing contractor, captain of Company D, First Regiment, Illinois National Guard.

Lieutenant-Commander and Paymaster G. C. Hall, treasurer of the McRae & Roberts Co., Detroit, serving with the First Battalion of the Michigan Naval Militia.

Captain William D. Bucklin, Chicago, sales manager for the Fulton Co., Knoxville, Tenn.; formerly attached to the coast artillery of the Rhode Island National Guard.

Colonel Edward McGowan, president and founder of the McGowan Plumbing Co., Memphis, Tenn., who saw service in the Spanish-American War. Now engaged in promoting recruiting in Memphis.

Lieutenant A. Gloeckner, of Gloeckner & Melville, heating and plumbing contractors, St. Louis, Mo., attached to Company A, First Regiment, Missouri National Guard.

In addition to the foregoing, New York City is represented by a number of men in the trade, prominent among whom is Lieutenant William G. LeCompte of Jenkins Bros., New York, who is on service "somewhere in New York State" with the Seventh Regiment, New York National Guard.

A. M. Maddock, president of Thomas Maddock & Sons Co., Trenton, N. J., has been commissioned captain in the United States Army, in connection with his services as chairman of the Committee to Supply Sanitary Equipment for Concentration Camps.

M. M. Cochrane and H. H. Sargent, president and treasurer, respectively of the Cochrane-Sargent Co., St. Paul, Minn., have joined the Officers' Reserve Camp at Fort Snelling, Minn.

Charles L. Collette, advertising manager of the Kewanee Boiler Co., Kewanee, Ill., has joined the officers' training camp at Fort Sheridan, Ill.

Albert Wallace Hills, manager of the Chicago branch of the Haydenville Co., Haydenville, Mass., has enlisted as gunner on a scout-patrol boat of the mosquito fleet.

H. A. Voss, chief clerk; C. G. Dennison, assistant credit manager; E. H. Locke and A. T. Burr, all of the American Radiator Company, are in training at Fort Sheridan, Ill., for the Reserve Officers' Corps. Among other men connected with this company, are now in government service are N. Coltrin, militia; C. S. Gardiner, engineering corps; Robert Salvage, militia; H. R. Wesley, engineering corps; H. F. Straw, navy; and Eugene Willoughby, engineering corps.

Thomas F. Manville, president of the H. W. Johns-Manville Co., New York, has been appointed chairman of the Co-Operative Committee on Asbestos, Magnesia and Roofing, of the Advisory Commission of the Council of National Defense.

Readers of THE HEATING AND VENTILATING MAGAZINE are requested to send in additional names of members of the craft who are already called out or who are at present in military organizations that are likely to see active military service. The additions to the list will be published as received under the permanent heading of "Heating Men in Military Service."

Adjusting the Government's War Purchasing Machinery.

How government specifications are being changed to meet practical war conditions; how sources of supplies are being surveyed and developed to satisfy a demand heretofore unheard of; and how conclusions are being reached as to fair and reasonable prices; are questions gone into in the first of a new series of war bulletins. They are to be prepared under the direction of Waddill Catchings, of New York, just appointed an assistant to the director of the Council of National Defense. Mr. Catchings is also the chairman of a new committee of the Chamber of Commerce of the United States to cooperate with the council. The series will be issued through the National Chamber for the purpose of placing before business men authoritative statements regarding government activities in procuring materials and supplies for the war.

Effective work has been accomplished, it is said, in adapting peace-time government specifications to immediate needs. A difficulty immediately apparent was that they were prepared years ago for our small army in time of peace and fell far short for the present necessities of a million or more men. For example—the glove specifications called for a seamless glove, of which not more than 500,000 could be made by all the equipment in the United States in a year. The men in the trade readily pointed out how on changing the specifications, an equally satisfactory glove could be manufactured by existing equipment in quantities to meet the requirements of millions of men.

At a conference between army engineers and fifteen chief engineers representing the principal truck manufacturers of the United States, a standard specification was adopted for trucks for war service and a definite beginning made in standardizing the military truck. Such a meeting also resulted in cooperation between manufacturers in the designing and developing of die and tool equipment to avoid duplication of similar work in numerous factories.

Engineering Council Formed by United Engineering Society.

An important step was taken by the four large national engineering societies June 27 when the first meeting was held of the Engineering Council. This body is a department of the United Engineering Society. It is composed of 24 members, five being appointed by each of the founder societies and four by the United Engineering Society. The council, of which I. N. Hollis is president, discussed ways and means by which the founder societies through the council may be of use to the nation. A resolution was adopted instructing the executive committee to cooperate with the government in procuring the services of engineers, while a committee of three was named, consisting of H. W. Buck, A. M. Greene, Jr. and Edmund B. Kirby, to consider the best means of utilizing the inventive ability of members of the founder societies.

Duties and Opportunities Presented to American Manufacturers by the War.

Modern war creates tremendous activity—it calls into use every material resource of a country—its whole machinery of production and distribution. A little over two years of world war have brought to this country a volume of business, the like of which we have never before known. Our power to produce has been taxed to the limit. Constructive effort—constructive selling—has often had its mettle tested during that time. Greater opportunities—greater tests are at hand.

Since it has been true that with our country

at peace our prosperity has been unprecedented, what will it be with our country at war, with every effort being put forth to win? Billions of dollars bonds have been voted to pay for huge purchases of supplies. The billions of dollars provided for in the joint loan and revenue budget of the government are equal to the total value of our enormous export trade during the past 18 months. The effect of putting this huge sum into circulation will be colossal. Its effect upon factories, warehouses, arms of transportation, are almost inconceivable at the moment.

Prosperity in all industries producing the necessaries of life—food, clothing, munitions, utensils and supplies, will be limited during the next twelve months only by capacity to produce and transport. Industries producing the non-essentials may languish. From them both capital and labor may be diverted.

The farmer will produce mammoth crops. He will need quantities of wagons, trucks, plows, harrows, reapers, tractors and binders. And he will have the money to pay for them. His annual cash income has lately averaged about $1,500. The government estimates that in the next twelve months it will be $2,500. Think of the purchasing power of 6,500,000 farms.

Will American business men be ready? Will they have the factory and storage capacity, the transportation facilities, to take care of this flood tide of business? Will they prepare constructively on a scale which will give full play to output with minimum waste? Or, will they drift day by day from hand to mouth in a spirit of shortsighted fear and wait for the deluge to engulf them?

THE TIME TO BUILD IS NOW, BEFORE MATERIALS RUN SHORT, TRANSPORTATION BECOMES STILL MORE CONGESTED AND LABOR IS DRAFTED INTO MILITARY SERVICE.—*J. P. Bock, before the World's Salesmanship Congress.*

Stenographers Needed by Government.

The United States government is in urgent need of great numbers of stenographers and typewriters, both men and women, for service in the departments at Washington, and the situation in federal offices outside of Washington is scarcely less urgent, according to an official notice received from John A. McIlhenny, president of the United States Civil Service Commission. Examinations for the departmental service in Washington for both men and women are held every Tuesday in 400 of the principal cities. Examinations for the field service (positions outside of Washington) are held frequently. The usual entrance salaries range from $900 to $1200 a year. Applicants must have reached their eighteenth birthday on the date of examination. Full information, etc., will be mailed on application to the United States Civil Service Commission, Washington, D. C., or to the secretary of the United States Civil Service Board of Examiners in Boston, Philadelphia, Atlanta, Cincinnati, Chicago, St. Paul, Seattle, San Francisco, New York, New Orleans and St. Louis.

Statistics of the Heating Industry in the United States

Inquiries received from time to time as to the amount of capital invested in the heating industry in the United States, the value of the annual output and other items have largely gone unanswered, except in the most general terms, due to a lack of definite information on the subject. This information has now been supplied by the Government in a volume that has just been published by the Department of Commerce, entitled, "Abstract of the Census of Manufacturers, 1914," but actually taken in 1915.

The volume, which contains no less than 720 pages, gives, for 340 separate manufacturing industries, statistics relating to number, size and character of ownership of establishments and States in which located; proprietors, officials, salaries, employees and wage earners; salaries and wages paid, power used, fuel consumed, cost of materials, value of products, quantities of principal products and various other items.

The meat of the volume is contained in four general tables which assemble the more important data in convenient form. That part of the table referring to the manufacture of steam fittings and steam and hot water heating apparatus is given herewith as Table 1. In studying Table 1 it should be noted that the establishments included in this industry manufacture principally steam and hot water radiators, safety valves, engine indicators, pressure and vacuum gauges, water gauges, hydrants and cocks, coils and bends of iron, brass and copper pipe, unions and flanges, and similar fittings. The manufacture of stoves and furnaces, including doubtless some hot water heaters, is classified as a separate industry. There is considerable overlapping with the foundry and machine-shop industry and with some other industries.

Because of changes in classification, the figures for 1889 are not closely comparable with those for later censuses.

Radiators and cast-iron heating boilers to the value of $50,982 were reported by makers

TABLE 1—SUMMARY FOR STEAM FITTINGS AND STEAM AND HOT WATER HEATING APPARATUS.

	Number of establishments.	Wage earners (average number).	Primary horsepower.	Capital	Wages	Cost of materials	Value of products	Value added by manufacture
STEAM FITTTNGS AND STEAM AND HOT-WATER HEATING APPARATUS.								
United States								
1914	295	26,388	38,630	$85,853,000	$16,738,000	$26,921,000	$63,922,000	37,001,000
1909	288	23,378	33,008	59,810,000	13,891,000	22,534,000	54,084,000	31,550,000
1904	176	11,690	10,696	28,541,000	6,582,000	10,425,000	24,911,000	14,486,000
1899	227	9,252	6,510	18,233,000	4,983,000	10,220,000	22,085,000	11,865,000
1889	217	10,645	7,224	17,017,000	6,204,000	10,628,000	23,147,000	12,519,000
1879	95	2,474	.....	3,076,000	1,306,000	2,857,000	5,128,000	2,271,000
1869	59	1,141	239	1,606,000	854,000	1,424,000	3,425,000	2,001,000
1859	28	665	.....	507,000	200,000	367,000	1,029,000	662,000
States, 1914								
California	4	15	24	61,000	15,000	25,000	56,000	31,000
Connecticut	14	3,371	5,297	8,752,000	1,922,000	2,706,000	6,454,000	3,748,000
Illinois	34	2,579	4,492	7,857,000	1,540,000	2,356,000	5,470,000	3,114,000
Indiana	8	513	841	1,523,000	336,000	519,000	1,147,000	628,000
Iowa	4	66	123	419,000	43,000	101,000	335,000	234,000
Massachusetts	21	3,175	2,810	7,365,000	2,019,000	2,019,000	5,910,000	3,891,000
Michigan	14	1,095	1,232	2,273,000	796,000	1,130,000	2,915,000	1,785,000
Minnesota	14	269	268	1,309,000	190,000	430,000	1,186,000	756,000
Missouri	7	533	776	2,334,000	370,000	584,000	1,320,000	736,000
New Jersey	12	622	960	1,986,000	421,000	692,000	1,722,000	1,030,000
New York	46	4,898	7,751	19,013,000	3,365,000	5,966,000	13,097,000	7,131,000
Ohio	33	2,414	3,979	7,451,000	1,546,000	2,305,000	6,315,000	4,010,000
Pennsylvania	57	5,747	8,246	21,600,000	3,475,000	6,705,000	14,999,000	8,294,000
Wisconsin	9	327	493	1,375,000	206,000	374,000	880,000	506,000
All other states[1]	18	764	1,338	2,535,000	494,000	1,009,000	2,116,000	1,107,000

[1] Includes: Alabama, 3 establishments; Colorado, 1; Delaware, 1; Kansas, 1; Maine, 1; Maryland, 1; New Hampshire, 1; Oregon, 1; Rhode Island, 3; Tennessee, 1; Vermont, 1; Virginia, 1; Washington, 2.

TABLE 2—SEPARATE DATA FOR THE HEATING INDUSTRY FOR 1914.

INDUSTRY	Number of establishments	Wage earners (average number)	Capital	Wages	Cost of materials	Value of products	Value added by manufacture
Steam fittings and steam and hot-water heating apparatus	295	26,388	85,853,000	16,738,000	26,921,000	63,922,000	37,001,000
Radiators and cast-iron heating boilers	89	10,341	34,657,000	7,033,000	9,601,000	23,477,000	13,876,000
All other	206	16,047	51,196,000	9,705,000	17,320,000	40,445,000	23,125,000
Stoves and hot-air furnaces	438	29,535	78,524,000	20,777,000	23,802,000	67,941,000	44,139,000
Stoves and ranges	286	25,304	67,243,000	17,685,000	18,642,000	55,108,000	36,466,000
Hot-air furnaces	141	4,042	10,844,000	3,002,000	4,791,000	12,081,000	7,290,000
Fireless cookers	11	189	437,000	90,000	369,000	752,000	383,000

of other steam fittings, and to the value of $1,482,532 by establishments assigned to other classifications, principally stoves and hot-air furnaces, structural ironwork, tools, electrical machinery, apparatus, and supplies and plumbers' supplies, not elsewhere specified.

"All other" steam fittings to the value of $2,414 were reported by makers of radiators and cast-iron boilers, and to the value of $53,873 by establishments assigned to other classifications, principally foundry and machine-shop products.

Table 2 presents separate data for 1914 for the two branches of the industry, "radiators and cast-iron heating boilers" and "all other" steam fittings, and for "stoves and ranges," "hot-air furnaces," and "fireless cookers."

Hot-air furnaces to the value of $1,907,712 were reported as made by manufacturers of stoves and ranges and to the value of $390,533 by establishments assigned to other classifications.

Copies of the "Census of Manufacturers" may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 65 cents a copy.

Death of John Bartlett Pierce.

John Bartlett Pierce, one of the founders of the American Radiator Company, and its vice-president, died at his home in Lynnfield, Mass., June 23. Mr. Pierce, who was also known as the founder of the radiator business in this country, was 73 years old. He left an estate valued at $5,000,000, $1,000,000 of which is to be divided among 400 of the older employees of the American Radiator Company, with further provisions giving them 60% of the income on $2,500,000, this principal also ultimately to be distributed among them with certain limitations. The employees who participate in the bequest must have been in the service of the company at least ten years at the time Mr. Pierce drew his will, in December, 1913.

A surplus caused by the limitation referred to is to be used for the establishment of the John B. Pierce Foundation for technical research in heating, ventilating and sanitation "to the end that the general hygiene and comforts of human beings and their habitations may be advanced."

The funeral services, which were held at the Pierce home, were attended by more than 2,000 persons, including representatives of the American Radiator Company from every city east of Kansas City. The pall-bearers included, C. K. Foster, W. H. Hill and Louis Bruch.

Important Changes in Methods of National Association of Master Plumbers.

The recent convention of the National Association of Master Plumbers, held in Evansville, Ind., June 18-20, marked the opening of a new era in that organization. The numerous government suits against members of the association have now all been settled by the payment of fines, while the resolutions under which the suits were brought have been definitely rescinded and the association has pledged itself to conduct its affairs in strict conformity with the course laid down by the government. There was some doubt, even, as to the propriety of issuing the association's "Red Book," containing a list of members, but this, it was decided, was permissible, provided copies of the "Red Book" are not distributed among manufacturers and others outside the association's membership.

Another action taken was the elimination of the office of State vice-president. These officers were cited by the government as one of the agencies through which the association exerted an unlawful influence upon the manufacturers.

The convention voted to meet next year in St. Louis.

Following are the new officers: President, L. McNamara, St. Louis; vice-president, F. B. Lasette, New York; treasurer, Charles J. Herbert; secretary, A. A. Zertanna.

National Association of Engineers.

At an adjourned meeting of the convention of the American Association of Engineers, held July 13, Edmund T. Perkins, of the Edmund T. Perkins Engineering Co., Chicago, was elected president. Following several stormy sessions of the convention over the proposed constitution, one was finally adopted. A resolution was also adopted forming a patriotic league of engineers which provides for a census of engineers and to look after the dependents of enlisted men. Co-operation with other engineering societies is to be fostered.

National Association of Sheet Metal Contractors.

An interesting feature of the recent convention of the National Association of Sheet Metal Contractors was the report of the warm air furnace committee. This breezy document reviewed the efforts made to have the University of Minnesota disavow the bulletin issued under its auspices by Professor J. L. Mowry, reflecting on the warm air furnace. It seems, however, that instead of doing so, the university loaned to the University of Missouri the plates used in the objectionable bulletin, and that the bulletin was republished by the University of Missouri word for word. "Up to this time," says the report, "The University of Minnesota seems to have done nothing to rectify its error."

The report also called attention to another "attack" on warm air heating contained in Bulletin 97, issued by the Bureau of Mines, Washington, D. C., and prepared by Professor L. P. Breckenridge and S. B. Flagg. (This bulletin was reviewed in THE HEATING AND VENTILATING MAGAZINE for November, 1915.)

The fact that *The Metal Worker,* of New York, republished "this budget of misinformation" is commented on in a way that brought the following rejoinder from Frank K. Chew, editor of *The Metal Worker:*

"The report of the committee indicates that a trade paper has printed something from the government reports which it should not have done. When you pay taxes to the United States Government for the various bureaus, and the Government selects the men who know most about the subjects upon which papers

are written, it is necessary for a trade paper to take the Government document and lay before you the information contained therein, and it is the proper function of the trade paper to reflect what is being done. This is what was done in the particular instance mentioned in the report."

On the subject of the "pipeless" furnace the committee warned manufacturers and dealers against extravagant and misleading language in advertising and selling these furnaces.

AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS

Committee on Ship Ventilation at Work.

Visits to the Norfolk Navy Yard and to the Brooklyn Navy Yard have been made by the committee appointed by President Lyle, at the request of Admiral Taylor, chief of the Bureau of Construction and Repairs, Navy Department, to co-operate with the Department on the ventilation of battleships and submarines. The members of the committee are Walter S. Timmis, New York; Willis H. Carrier, New York; C. H. Dusold, New York; F. R. Still, Detroit and Dr. E. Vernon Hill, Chicago.

New Publications.

THE ECONOMICAL PURCHASE AND USE OF BITUMINOUS COAL FOR HEATING HOMES, with special reference to conditions in Illinois, is the title of a new bulletin issued by the Engineering Experiment Station of the University of Illinois. The point is made in the bulletin that if every householder and owner of a small house heating plant in the state of Illinois would use reasonable care in the purchase of his fuel and in the operation of his plant, the saving would be equivalent to 4,500,000 tons of coal. According to a circular just issued by the Engineering Experiment Station of the University of Illinois such a saving is easily within the range of practical attainment. Applied to the entire United States, intelligent attention in the operation of house heaters would save more than 60,000,000 tons of coal.

The University of Illinois has discussed, in the circular referred to, the more important factors involved in the installation of a satisfactory house heating system, and has set forth the most economical methods of firing soft coal and operating a house heating plant. The properties of fuels, and the processes attending their combustion are discussed in a fashion which is intended to help the average householder to understand his problem and to secure the economics of intelligent operation.

Tables giving the trade names, geologic names, and average heating value of the coals of the central western area are contained in the circular and a chart is presented to show the relative worth of coals of different heating values. Some attention is also given to the properties of eastern coals. Diagrams in color illustrate the usual heat losses which occur and suggest the means to be employed in overcoming them. Methods and devices for regulating house heaters are shown by drawings, and the importance of proper chimney height, of air-tight flues, and of various dampers and regulators is emphasized by a number of illustrations.

Copies of this circular may be had by addressing the Engineering Experiment Station, Urbana, Illinois. The price is ten cents.

Trade Literature.

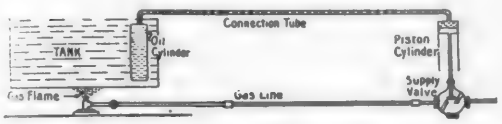
KEWANEE ON THE JOB, the title of a well-designed publication issued by the Kewanee Boiler Co., Kewanee, Ill., contains 40 pages of illustrations of buildings equipped with Kewanee boilers or other Kewanee equipment. This section is followed by a partial list of buildings heated with Kewanee smokeless boilers, arranged by States. The concluding section is devoted to "Kewanee —Its Products and Their Home." Contrasting views are shown of the company's works in 1892 and in 1917. These are followed by detailed views, cut away to show the construction features, of the Kewanee smokeless boilers, brickset and portable; the Kewanee boiler, brickset and portable; Kewanee radiators for steam or water; Kewanee garbage burners, Tabasco water heaters and Kewanee tanks. Size 8½ x 11 in. Pp. 80.

BEACH-RUSS PATENTED VACUUM PUMPS for heating systems is the subject of a new bulletin (No. 20) which presents in concise form the essential data regarding the company's line of return line pumps, vacuum pumps for air-line vacuum systems, and the Beach-Russ automatic condensation pump receiver. Size 6 x 9 in. Pp. 4.

HOW SARCO TEMPERATURE REGULATORS WORK is told in a circular recently issued by the Sarco Co., Inc., Woolworth Building, New York.

If a metal cylinder completely filled with oil is hermetically sealed and then heated, the oil will expand with such great force as to split the cylinder. This enormous pressure is utilized in the Sarco temperature regulator.

Referring to the illustration below, the oil cylinder communicates through a pipe with another cylinder in which there is a piston, the entire system being completely oil filled. The piston in the piston cylinder actuates a valve. If the oil cylinder is immersed in a tank containing the fluid, temperature of which is to be regulated and that tank is heated, say by a gas flame, the supply of gas to which is regulated by the supply valve, the mode of operation is obvious. When the temperature of the tank liquid rises, heating the oil in the oil cylinder, the expanding oil pushes the piston outward in its cylinder and closes down the supply valve, thus reducing the gas flame. If on the other hand the tank temperature

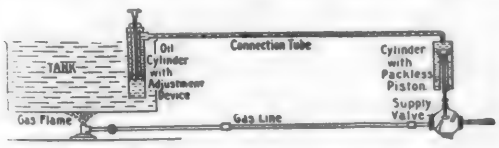


falls the oil in the cylinder cools and contracts, thus allowing the piston in the piston cylinder to go back under the influence of a spring (not shown) opening the supply valve and thus turning the gas flange higher.

It is imperative that the piston packing be leak-proof, capable of withstanding the enormous pressures which are involved, and at the same time frictionless. Here the Sarco spirally corrugated tube comes into play, a section of the same being hermetically attached to the outer surface of the piston at one end, and to the inner skirt of the oil

cylinder at the other end, as shown in the illustration below. The Sarco spirally corrugated tube, it is stated, will withstand pressures in excess of 3,000 lbs. per square inch.

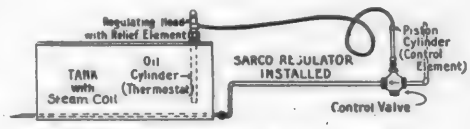
While the regulating system as so far described is complete and would be commercially operative, it is naturally desirable to add some means of adjusting the temperature setting. This is accomplished by having the connection tube issue from the side of the oil cylinder instead of from the top, and then inserting



from above a piston which can be adjusted up or down by a regulating screw. When adjusted downward the temperature in the tank need evidently rise less before pressure is transmitted through the connection tube to close the supply valve, and if adjusted upward the temperature must rise higher before closing will take place. The construction is shown in the illustration below. It will be seen that Sarco spirally corrugated tubing is again brought into service to provide a pressure-proof packless flexible fit.

The Sarco regulator is also equipped with a relief element which will yield if the pressure after the control valve has been closed should for some special reason continue to rise and exceed even the high limit of strength of the Sarco tubing. That element is a special heavy spring interposed between the manually adjustable head of the rod in the oil cylinder and the piston which the rod pushes. The spring strength is such that it will yield when pressure is too high, restoring itself to normal length when normal conditions are resumed.

The Sarco temperature regulator operates gas, steam or water valves and can be used for tank or atmospheric control.



SARCO SYSTEM COMPLETE.

NOT NEEDED WITH THE WEBSTER SYSTEM OF STEAM HEATING is the title of a circular giving the comment of Warren Webster & Co., Camden, N. J., on the notice contained on a tag found in a hotel room. The notice read, "In operating the radiator, please open the valve as far as it will go. To shut off heat, close valve tight. Do not open valve a little, thinking you will get a small quantity of heat, as the pipes will make a noise and fill with water, which will run out, ruining carpet and walls below." These precautions are not needed with the Webster system of steam heating, it is pointed out, as no air valves are used and control is had of each radiator by one valve. Turning it off or on, as much as desired, will result in modulation of temperature. A partial list is added of the 400 hotels heated by the Webster system.

WALKER WROUGHT-IRON RADIATOR, manufactured by the Kansas City Radiator Co., Kansas City, Mo., is an interesting product which has recently been placed on the market and which is illustrated and described in a catalogue issued by the company. The Walker radiator is designed for use with steam, hot water, vapor and vacuum systems, and is the invention of Thomas H. Walker. Among the

WALKER SECTIONAL AND INTERCHANGEABLE RADIATOR

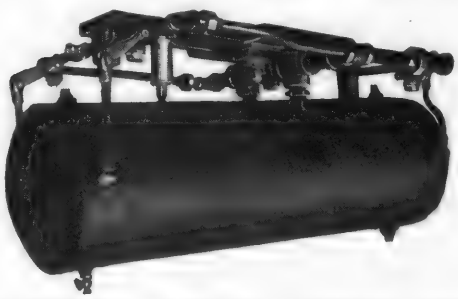
advantages gained by the new construction are the diminishing of the floor space occupied by the radiator nearly one-third, as compared with a cast-iron radiator; the neat appearance of the new type, and the increase in heating efficiency, without sacrifice of strength or durability. The radiator is made of wrought-iron, combined with a copper alloy to make it non-corrosive and rust-resisting. It is sectional and interchangeable, being made without end or leg sections. The legs, which are separate pieces, are also adjustable to variations in height from the floor. An ingenious interlocking device is used in the construction which, it is stated, enables the radiator to withstand high pressures and rough usage. It also eliminates the punching of holes and the use of rivets.

Organization of the Farnsworth Company.

Following the retirement from business of the Farnsworth Mfg. Co., of Boston and New York, F. C. Farnsworth, who was prominently identified with the former company, has organized the Farnsworth Company, with general offices and plant at Conshohocken, Pa. Mr. Farnsworth, in describing the new line of steam utilities being manufactured at Conshohocken, states that he has re-designed and rebuilt an entirely new line of steam traps, both as regards principle and operation, capable of handling condensation under any condition. The tanks, all valves, fittings and connections are extra-heavy and tested to 400 lbs. pressure. Each tank is carried on a steel shaft with a Babbitt metal bearing to reduce friction. There is no load on the trunnions which consist of the Tuxedo swing joint. The valve is a straight-through blow valve, extra heavy, and all apparatus carrying a pressure of 100 lbs. or more is equipped with Monel metal seat and disc valves.

Oil-cushion dash-pots are used on all of the larger machines to relieve any jar or shock in the oscillation, while graphite lubricator cups are supplied with all machines to keep the valves and swing joints well lubricated.

Extra heavy material is also used in the construction of the company's line of duplex boiler feeders. The tank of the boiler feeder is of electric-weld construction and is tested to 500 lbs. hydrostatic pressure before being sent out. All connections into the tank are also welded. Each machine is equipped with oil dash pots to relieve all possible shock or jar in the operation of the tanks. This boiler feeder, it is stated, is particularly well adapted for feeding high-temperature condensation direct into the boilers. It acts in the capacity of a receiving tank, boiler feed pump and



FARNSWORTH VARIABLE PRESSURE TRAP FOR DRAINING APPARATUS IN WHICH THE PRESSURE CHANGES FROM HIGH TO LOW.

pump governor, as it automatically receives the discharging water from all steam traps, dry kilns, heating system lines, etc., and feeds it direct into the boiler. With its duplex or double-compartment tank construction provides a continuous process of receiving condensation and delivering it into the boilers.

The company's complete line includes tilting steam traps, automatic duplex boiler feeders, together with return, separating or non-return, lifting, vacuum, condenser and variable pressure traps.

Carrier Psychrometric Chart.

A distinct service has been rendered to the heating and ventilating trade by the Carrier Engineering Corporation, New York, in sending out a well-mounted and framed psychrometric chart, accurately drawn and ready for use. The chart measures 17 in. x 11 in. and is mounted on metal, adding much to its durability.

UNDERWRITERS' RULES.

The National Board of Fire Underwriters has adopted certain rules and regulations governing heating and ventilating systems. The regulations are divided into three main divisions: (1) Fans, (2) Ducts and Flues, and (3) Kitchen and Cooking Vents. These rules are as follows:

BLOWERS. The word blowers is used to include blowers and fans.

(*a*) Blowers shall be so located as to be accessible for repairing and lubricating.

(*b*) Casings to be strongly built and properly reinforced where necessary; joints shall be air-tight. Casings and runners shall be entirely non-combustible, and large enough not to require overspeeding. To prevent accidents openings into casings shall be protected with substantial screens or their equivalent.

(*c*) Bearings and journals to be constructed in accordance with the best modern machine design and so proportioned as to prevent overheating. The bearings shall be self-oiled and so designed as to prevent leakage of oil. They shall be located outside of casings or ducts wherever possible. If located inside of casings or ducts, oilless self-lubricating bearings shall be used, made of bronze bushings fitted with plugs, such as graphite or metaline.

DUCTS. The word ducts is used to include ducts, flues, pipes and tubes.

(*a*) Openings through floors for the circulation of air from one story to another shall not be used.

(*b*) Entire system of ducts to be self-contained; no rooms, hallways, attics, hollow spaces, voids, nor other portions of the building shall be used for air chambers or ducts, unless of fire-

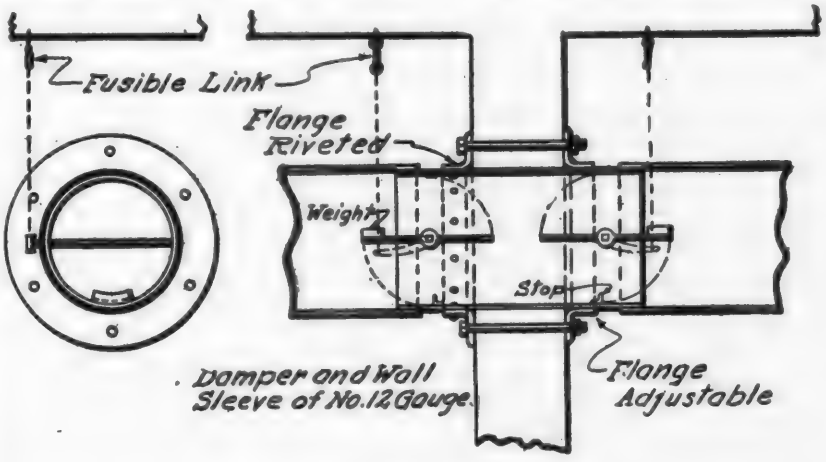


FIG. 1.

resisting construction, and then only by permission of the inspection department having jurisdiction.

(*c*) Ducts shall be made of galvanized iron or other approved non-combustible material. The same applies to enclosures of steam coils used for heating air.

(*d*) To be thoroughly braced.

(*e*) To be substantially supported by metal hangers, brackets or their equivalent.

(*f*) Where subject to mechanical injury, ducts to be properly protected.

(*g*) In no case shall the clearance between any metal ducts and combustible material be less than 1 in.

(*h*) The passing of ducts through fire walls should be avoided wherever possible. Where ducts pass through fire walls they shall be provided with automatic dampers, or national

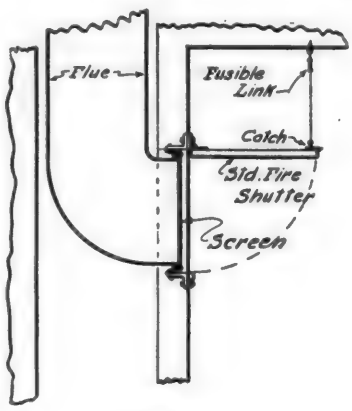


FIG. 2.

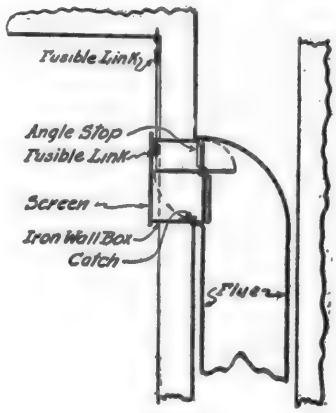


FIG. 3.

standard vertical automatic fire doors, located on each side of the wall through which they pass. (See Fig. 1.)

(*i*) All ducts passing through floors shall be made of, or protected throughout by, approved fire-resisting materials, such as 4 in. brick, hollow tile, or 2 in. cement-plastered partition, supported by a substantial steel frame.

(*j*) Where vertical ducts serve more than one floor, automatic dampers shall be provided on all outlet openings directly from such vertical ducts, and at all connections with branch ducts from such vertical ducts. (See Figs. 2 and 3.)

(*k*) Joints between ducts and floors, walls or partitions, must be made tight by non-combustible materials.

(*l*) Outlets on supply and exhaust ducts should always be protected by means of register faces or wire screens.

(*m*) Intake of air to be from outside except in re-circulating systems, and shall be taken only from areas containing non-

combustible material. Intakes must be protected with rolling shutters or heavy doors.

Intake and intake rooms, steam coils and blowers, etc. shall be segregated in a room cut off by fire-resisting partitions from other portions of the building.

(*n*) Blower systems should preferably have an emergency or automatic control to shut them down in case of fire. This may be done automatically by means of devices utilizing fusible links, thermostats, or automatic sprinklers. Such installations to be subject to the approval of the inspection department having jurisdiction.

COOKING APPLIANCES.

(*a*) Ventilating ducts used to carry off the grease-laden vapors from hoods over cooking appliances, especially in kitchens of large restaurants and hotels, shall be constructed similarly to boiler smoke flues, and, if of metal, must be of not less than No. 16 U. S. gauge, so substantially built that the grease and gum could be removed from the interior by burning out under a flash fire.

(*b*) The ventilating ducts shall be an independent system in no manner connected with other house ventilating systems.

(*c*) Ducts should not be connected to stacks, chimneys or flues used for other purposes.

(*d*) A live steam jet should preferably be provided at the end of the duct nearest the cooking appliances.

VELOCITIES RECOMMENDED FOR HEATING AND VENTILATING SYSTEMS IN SCHOOLS, PUBLIC BUILDINGS, CHURCHES, ETC.

Supply Air.

VELOCITY THROUGH FREE AREA.

Cold air intake	700 to 1000	f.p.m.
Cloth filter	about 40	"
Air washer	500	"
Heaters	800 to 1200	"
Horizontal ducts	1200 to 1400	at fan decreasing to 600 f.p.m. at base of vertical flues.
Vertical flues	400	f.p.m. for masonry flues. 500 f.p.m. for galv. iron flues.
Register outlet (free area)	200 to 250	f.p.m.
Grilles (total area)	" " "	"

Air outlets 15 ft. or more above the floor may be run up as high as 350 f.p.m. if not thrown directly down on persons below.

Exhaust Air.

VELOCITY THROUGH FREE AREA.

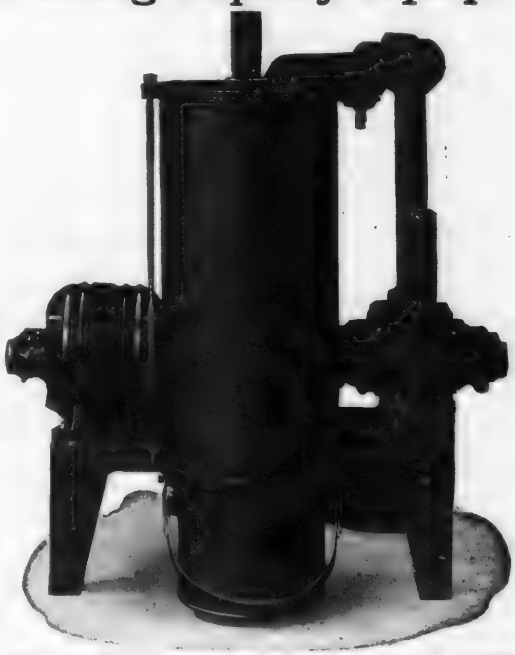
Registers or total area of grilles	300 to 400	f.p.m.
Vertical flues	400	f.p.m. for masonry flues 500 f.p.m. for galv. iron flues.
Horizontal ducts	600	f.p.m. at far end up to 1200 or 1400 f.p.m. at fan inlet.
Discharge openings	700 to 1000	f.p.m.

Stationary vacuum cleaners for any size building

With the ARCO WAND you can specify cleaning requirements for the *smallest* residence or the *largest* business block. Factories, warehouses, apartments, theaters, churches, clubs, hotels—either new or remodeled buildings are being rapidly equipped with the

ARCO WAND VACUUM CLEANER

Made as *one* sweeper or *two* sweeper machines with tool equipment to meet any cleaning need. The ARCO WAND is a substantial and durable machine built for long, steady service and in its many years of use has withstood tests of continuous daily cleaning with greatest satisfaction to users.



This cut illustrates type Numbers 341 and 361 ARCO WAND with electric motor direct drive

Send for catalogs. We will be glad to cooperate and assist to specify ARCO WAND Vacuum Cleaners for buildings of any kind or size

AMERICAN RADIATOR COMPANY

Sales branches and showrooms in all the large cities

A Builder of Reputations

Here's a Controller for Electric Motor Driven Vacuum Pumps

that will establish your reputation for selecting satisfactory apparatus. It is a dependable, sturdy machine which will continue to give perfect service for years.

This controller can't be beat for steady reliable, year-in-and-year-out service, because it's made to stand up under the hard usage to which such instruments are necessarily subjected.

See that Powers equipment is used whenever you are consulted.

Results will put an "O. K." on your judgment—and that's what builds reputations.

Write for Bulletin 127

The Powers Regulator Co.

954 Architects Building, New York
2143 Mallers Building, Chicago
365 The Federal Street Building, Boston
The Canadian Powers Regulator Co., Ltd., Toronto, Ont.

ADVERTISERS' INDEX

Air Moistener Co., The..... 87
Alberger Pump & Condenser Co..... 14
Alberger Heater Co..... 78
American District Steam Co..... 84
[illegible]er Co..... 79
American Radiator Co..... 67
Badger & Sons Co., E. B..... 4
Bayley Mfg. Co..... 9
Beach-Russ Co..... 86
Bicalky Fan Co..... 16
Blomfeldt & Rapp Co..... 12
Braemer Air Conditioning Corporation.. 12
Bristol Co., The.....Front Cover
Buffalo Forge Co..... 7
Carrier Engineering Corporation..... 13
Central Station Steam Co..... 80
Clarage Fan Co.....Second Cover
Connersville Blower Co..... 3
Davis Regulator Co., G. M..... 90
Detroit Lubricator Co..... 73
Dole Valve Co.....Front Cover
Dunham Co., C. A..... 16
Economy Pump Machinery Co..... 87
Foster Engineering Co..... 86
Fulton Co., The..... 82
Garden City Fan Co..... 70
Gurney Heater Mfg. Co.....Front Cover
Harrison Safety Boiler Works..... 88
Hornung, J. C..... 89
Howard & Morse..... 69
Ilg Electric Ventilating Co..... 74
International Heater Co..... 83
Jenkins Bros..... 71
Johns-Manville Co., H. W..... 77
Johnson Service Co..... 76
Kewanee Boiler Co.....Fourth Cover
Knowles Mushroom Ventilator Co., Front Cover
Lavigne Mfg. Co..... 72
Lord & Burnham Co.....Third Cover
Marsh Co., Jas. P..... 3
Mason Regulator Co.....Front Cover
McAlear Mfg. Co..... 14
Moline Heat..... 89
Mueller Mfg. Co., H..... 10
National Air Cell Covering Co..... 85
National Tube Co..... 6
Ohio Blower Co..... 80
Patterson & Co., Frank..... 87
Plant Engineering & Equipment Co.... 5
Powers Regulator Co.....68 and 81
Pressweld Radiator Corporation..... 11
Ric-Wil Co..... 82
Ross Valve Mfg. Co.....Front Cover
Sarco Company, Inc..... 81
Schaeffer & Budenberg Co..... 89
Sims Co., The..... 90
Sprague Electric Works..... 9
Standard Thermometer Co..... 71
Standard Wood Pipe Co..... 82
Sturtevant Co., B. F.....75 and 80
United Vacuum Appliance Co..... 87
Webster & Co., Warren..... 83
Westinghouse Electric & Mfg. Co..... 8
Wyckoff & Son Co., A..... 85

TRADE AND MISCELLANEOUS NOTES

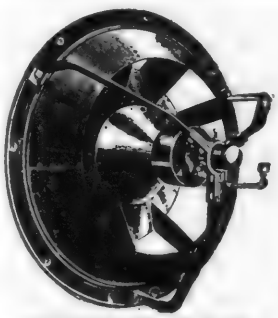
Miscellaneous Notes.

Chicago, Ill.—Unless smokeless furnaces are installed in Chicago office and apartment buildings by August 1, suits will be instituted in a campaign to abate the smoke nuisance, according to notices sent out by William Reid, smoke inspector of Chicago. The increase in the amount of smoke observed recently is due, it is stated, to the scarcity of Pocahontas coal, but the city officials declare smokeless furnaces will permit the use of Illinois and Indiana soft coal.

Davenport, Ia.—Apportionment of the $4,971,000 appropriation voted for the Rock Island Arsenal improvements and storage facilities includes $165,000 for a central steam heating plant.

Washington, D. C.—In discussing the type of heating system to be used in the army cantonments now under construction it was brought out that the equipment of approximately 10,000,000 sq. ft. of direct radiation will be required. No decision had been announced as to whether steam or hot air will be used, but it is probable there will be installations of each type. While it is desired that the cantonments be completed by September 1, additional time may be given in some cases for the installation of the heating plants. No decision was reached as to the price which the government will pay for heating plants except that they will have to be furnished at cost, plus a fair profit. In figuring this profit, all selling cost will be eliminated, as will any overhead cost usually included to cover loss by bad accounts. In case a manufacturer makes a price which seems to include too high an overhead cost, government experts will be sent to the manufacturer's plant to see if some apparently excessive overhead cannot be eliminated.

Mason City, Ia.—Public school buildings will be heated next winter from a new



DUPLEX CONE FAN
Belt Driven

HOWARD & MORSE
45 FULTON ST., N. Y.
Ventilating Engineers and Contractors
MANUFACTURERS OF
BLACKMAN and DUPLEX CONE FANS
which are installed by us complete with **Motors, Duct Work** and **Wiring.**

Aligning, Rigging and **Hoisting** done, with labor thoroughly qualified from long experience.

We make a specialty of **Kitchen Exhaust** work. Prominent buildings, hospitals, theatres, and private residences are among our many and recent installations.

The **Duplex Cone** Fans are semi-conoidal fans, made especially to operate against pressure in duct systems.

The **Blackman** Fans are used for fresh air delivery and in duct systems, when no great pressure is involved.

You can have the advantage of our experience.
SEND FOR CATALOGUE

BLACKMAN FAN
Direct Connected to Motor

central heating plant which is being built at a cost of $40,000. The plant is equipped with the Manhire system of combustion, in which the unburned carbon is directed back over the flames, to secure smokeless combustion. The buildings served from the new plant are the present high school building, the new high school building, the manual arts building and the Lincoln and Central Schools. The plans were drawn by J. H. Felt & Co., architects of Mason City and Kansas City.

Greenville, Pa.—At the expiration of the present natural gas contract for the heating of the court house and jail in Greenville, the county commissioners have arranged to build a new heating and power plant to serve these buildings.

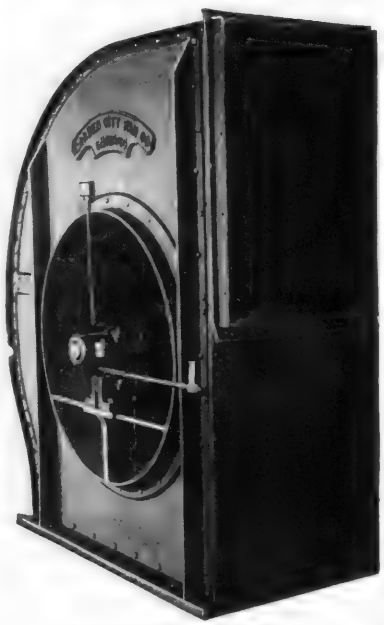
F. A. Clegg Co., Louisville, Ky., heating and ventilating engineers, has arranged to give half pay to all of its employees who are drafted or who enlist for service in the United States forces, this half pay to continue during the war. A. W. Clegg, of this company has already enlisted in the Quartermaster's Reserve Corps, to take up active duty August 1.

Building Operations for June indicate a shrinkage of 33⅓% as compared with the corresponding figures of a year ago. It is well-known, however, that last June's business was exceptionally large. As compared with the figures for June, 1915, there was a substantial gain. The total figures, according to the compilation of the *American Contractor,* Chicago, were $61,287,611, as compared with $95,964,469 for June, 1916. Increases were reported by Atlanta (166%), Erie (47%), Harrisburg (528%), Kansas City (452%), South Bend (212%), Spokane (184%), Washington, D. C. (41%) and Youngstown (199%). The principal losses were reported from Boston (18%), Buffalo (20%), Chicago (58%), Cincinnati (39%), Detroit (25%), Newark (7%), New York (54%), largely due to the fact that last year the figures were swelled on account of new zoning law, which was about to go into effect; Philadelphia (55%), San Francisco (12%), St. Louis (25%) and St. Paul (43%).

Boston, Mass.—Mayor Curley has asked the city council to approve an order for $75,000 for a new heating plant at Deer Island. The total estimated cost of the plant is $109,000, and about $40,000 is available.

Des Moines, Ia.—A large delegation of Des Moines business men went to Washington recently to ask for a hearing before the construction committee of the Council of National Defense in connection with the building of the cantonment at the Hawkeye

CYCLOIDAL MULTIVANE FANS



Scientifically Constructed for

Efficiency and Durability

The result of 35 years' experience in the manufacture of Ventilating Apparatus.

Have You Got Our Data Book No. 160?

143 Pages of

Engineering Data, Capacities, Power, Dimensions

It's worth writing for

GARDEN CITY FAN CO.

Sole Manufacturers
McCormick Bldg.,

Established 1879
CHICAGO, Ill.

Patented May 26, 1908

L. J. WING MFG. CO.
New York City

KARSTENS ENG. SALES CO.
Detroit, Mich.

W. G. McPHERSON CO.
Portland, Ore.

capital. According to the plans of the Council, a single contract was to be awarded for the construction of the cantonment, so that local supply firms, builders, heating contractors and others would have to deal with the general contractor. The entire cost of the Des Moines cantonment will be about $2,750,000.

Manufacturers' Notes.

Walworth Mfg. Co., Boston, Mass., it is announced, has purchased the Kewanee plant of the National Tube Company at Kewanee, Ill., the sale being effective July 1. The plant covers an area of 58 acres and employs 2,400 men. All of the company's valves, fittings, etc., for the western trade will be made hereafter at the Kewanee plant, which will be in charge of Charles A. Olson, formerly manager of the Walworth company's works in Boston. Shirley R. Mitchell, formerly of the company's New York branch, will have charge of the sales of the Kewanee plant products.

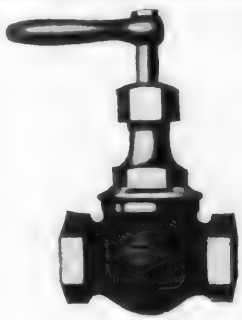
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., has received an order for furnishing the electrical equipment for the new Pennsylvania Hotel, now being built at Seventh Avenue and 33d Street, New York. This hotel, when completed, will be the largest in the world, containing 2,200 rooms, each with a bath. It is being built by the Pennsylvania Railroad and will be operated under the Statler management. The electrical equipment consists of 44 ventilating motors with a total capacity of over 200 h.p.; seven pump motors, with a capacity of over 200 h.p., and an additional number of motors for refrigerating machinery. The heating and ventilating contract for this building was let to Baker, Smith & Co., New York, and the plumbing contract to the W. G. Cornell Co. Tenney & Ohmes designed the mechanical equipment.

Warren Webster & Co., Camden, N. J., announce the removal of their Atlantic City branch office to 429 Guarantee Trust Building. Sidney B. Strouse is the district manager.

Hart Mfg. Co., Grand Rapids, Mich., recently incorporated with a capital stock of $50,000, to manufacture heating and ventilating systems for school rooms, theatres, railroad stations and other public buildings, has removed its plant to Louisville, Ky. The company recently received a government contract for $42,000 worth of work, including 64,000 pipe joints and 1,000 field ovens. The officers are: President, A. E. Hart; vice-president, P. E. Gordon; secretary, H. K. Cole; general sales manager, C. E. Olsen.

American Radiator Co., Chicago, Ill., has declared an extra dividend of 1% on its common stock for the benefit of the American Red Cross Fund.

Columbus Heating and Ventilating Co., Columbus, O., has taken over the business of the Ideal Heating Co., which has been in the hands of a receiver.



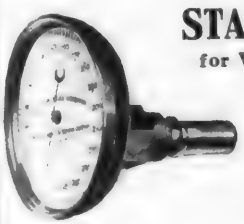
Jenkins Bros. Quick-Opening Valves

Perhaps you have occasion to specify valves for use in a factory, hotel or laundry, where they have to be opened and closed frequently, and saving of time is desirable. For such places we recommend Jenkins Bros. Quick-Opening Globe and Angle Valves with quadruple-threaded spindles. Can be opened full with only about one-quarter the usual number of turns.

There's a Jenkins Bros. Valve for practically every purpose. Include them in your specifications.

Jenkins Bros.

New York Boston Philadelphia Chicago Montreal London



STANDARD THERMOMETERS - Indicating and Recording

for VACUUM, STEAM and HOT WATER SYSTEMS, BAKE OVENS and COLD STORAGE PLANTS. SEVEN models of RECORDING and EIGHT of INDICATING Thermometers. All Accurate, Durable and Legible.

Backed by thirty years of Thermometer manufacturing.

They are practically indestructible, are sensitive to changing temperatures and are very easily installed. Supplied with horizontal or vertical extension and standard pipe thread.

Ask for catalog No. 100-107 and trade prices.

STANDARD THERMOMETER COMPANY, 65 Shirley St., Boston, Mass.

Please mention THE HEATING AND VENTILATING MAGAZINE *when you write.*

Pierce, Butler & Pierce Mfg. Corporation, New York, announces that its warehouse in Springfield, Mass., has been filled with a complete line of boilers and radiators, for taking care of the trade in that section.

Sims Co., Erie, Pa., has moved its New York office to 90 West Street, where its New York and export business will be handled under its general sales agency, W. B. Connor, Inc.

Illinois Engineering Co., Chicago, Ill., has purchased a new plant at Racine Avenue and 21st Street. The lot is 118½ × 100 ft. and it has been improved with a one-story reinforced concrete and steel building, containing 30,000 sq. ft. of floor space. The reported purchase price is $65,000, subject to an incumbrance of $30,000. The company manufactures vapor and vacuum heating systems and specialties for power plants.

Ross Valve Mfg. Co., Troy, N. Y., the business formerly conducted by George Ross, deceased, and his sons, William, John C. and Adam Ross, will be continued as an incorporated company. The firm was duly incorporated June 23, with William Ross, J. C. Ross, Adam Ross, Louis S. DeZouche and Ernest B. Perry as directors. Employees who have been in the employ of the company from 10 to 25 years will be given the opportunity to acquire stock in the company, the one-quarter interest of George Ross having been set aside for this purpose. The officers of the new company are: President, William Ross; vice-president, J. C. Ross; secretary-treasurer, Adam Ross; assistant secretary-treasurer, L. S. DeZouche; superintendent, Ernest B. Perry.

Herbert Boiler Co., Chicago, Ill., has been incorporated with a capital stock of $100,000. Incorporators: Michael E., William H. and Joseph J. Herbert, all of Chicago.

Moline Heat, Moline, Ill., has appointed Charles E. Bonnet, formerly manager of the heating and engineering department of E. F. Houghton & Co., Philadelphia, as sales representative for Philadelphia and surrounding territory.

Central Station Heating Notes.

Pottsville, Pa.—The Pottsville Steam Heat Company has sent notices to its patrons withdrawing the prices heretofore prevailing for heating service and announcing

The Troubles of a Leaky Valve

may not on first thought seem large. But think of them in terms of a year. Then add to that the cost of labor and inconvenience to your customers in replacing and repairing them.

These troubles are the real justification of

LAVIGNE
Packless Quick-Opening Steam Radiator Valves

A long-lived valve that is entirely different and somewhat better than the ordinary kind. It does not compete with the cheaper ones, but replaces them wherever used.

It positively does not leak air, water, or steam.

It opens quickly and closes just as quick.

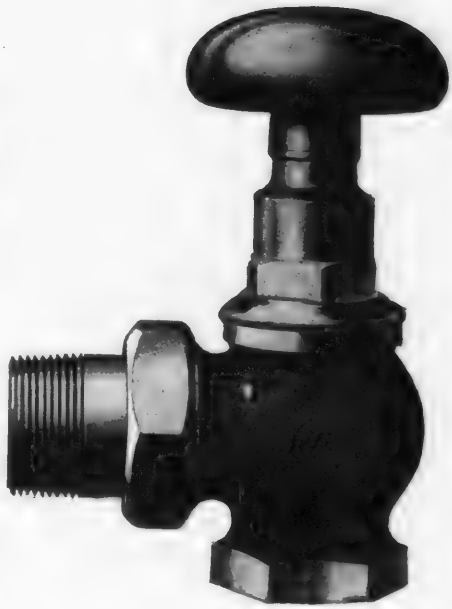
BUILT RIGHT TO STAY TIGHT

Made in six sizes, many styles

Ask Your Jobber for Details

LAVIGNE MANUFACTURING COMPANY, Detroit, Michigan

DETROIT PACKLESS RADIATOR VALVES



The Correct Valve for the Beautiful Home

Detroit Packless Valves are finished with the definite purpose, that they shall harmonize with the most beautiful surroundings. In addition to their unusually pleasing appearance and smooth satin finish they are permanently efficient and will not leak or need repacking.

Booklet VP-1 Gladly Sent Upon Request

DETROIT LUBRICATOR COMPANY
DETROIT, U. S. A.
CANADIAN DETROIT LUBRICATOR COMPANY LTD WALKERVILLE, ONTARIO

LARGEST MANUFACTURERS OF RADIATOR VALVES IN THE WORLD

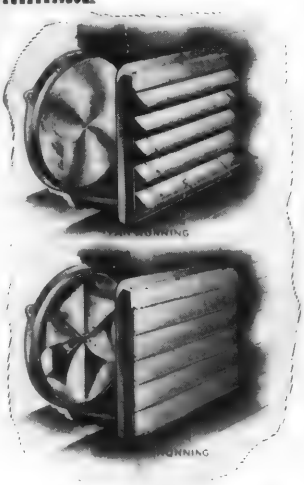
that, on account of the constantly increasing cost of coal, the rates for next season will probably be raised 41%. Some of the patrons of the company, which include most of the leading business houses and residences of the city, have announced their intention of appealing to the State Public Service Commission.

Spencer, Ia.—Spencer was to have a special election July 23, on the question of granting a franchise to the Spencer Heating Company, with the right to lay, install and construct mains in the streets to supply heat. The ordinance calls for heat mains to be laid on both sides of Main Street, as far south as Third Street. The company will purchase exhaust steam from the city to supply its patrons. It is planned to resell the steam at a price that will yield 7% after taking care of the operating expenses and also retire the capital stock within a period of twelve years.

Davenport, Ia.—A petition has been submitted to the city council by H. C. Blackwell, general manager of the People's Light Company, for permission to increase the heating rates. Mr. Blackwell stated that on account of the increase in the coal prices and operating expenses, such an increase would be necessary. The matter was re-

I L G

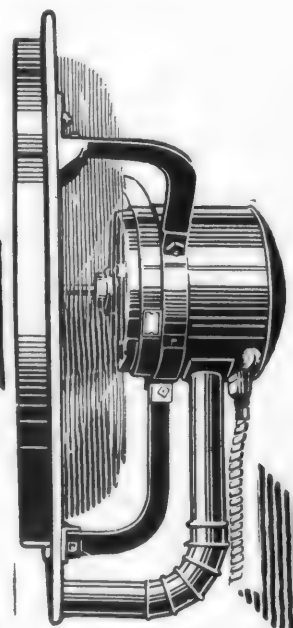
SELF-COOLED MOTOR PROPELLER FANS AND AUTOMATIC SHUTTERS



FAN WITH SHUTTER

For the Ventilation of Restaurants, Theatres, Offices, Factories

Low in Power Consumption
Quiet Running



SELF-COOLED MOTOR PROPELLER FAN

I L G Electric Ventilating Co.
158 Whiting St. CHICAGO
Branches—All Cities

Architect—Geo. M. Lawton, Seattle *Engineer—J. G. Turnbull, Seattle*
Heating and Ventilating Contractors—S. E. Brown & Co., Seattle

Masonic Temple, Seattle, Washington

Sturtevant
(REG. U.S. PAT. OFF.)

Apparatus

A first class, up-to-the minute building is the new Masonic Temple at Seattle, Washington. This is equipped with Sturtevant apparatus, because quality was the determining factor in the choice.

The equipment consists of three fans, three motors and a heater. Architects in the majority specify Sturtevant apparatus.

Catalog No. 230-V on Sturtevant Heaters is our latest publication of interest to engineers. Write for your copy.

B. F. STURTEVANT COMPANY
HYDE PARK, BOSTON, MASSACHUSETTS

And All Principal Cities of the World

Stationary Vacuum Cleaners Air Washers Fans
Heaters Motors

ferred to the finance committee of the council.

Indianapolis, Ind.—The Indianapolis Light & Heat Company has surrendered its franchise and will operate hereafter under an indeterminate permit provided by the public utility act. June 30 was the last day under the law on which franchises could be surrendered.

Lansing, Mich.—The Michigan Power Company has submitted a petition to the city council asking the city to relinquish the 2% gross receipts bonus which it has been receiving from the company since 1906, and also to allow the company to increase its rates for heating service. It is also proposed to add a coal rider to the company's franchise by amending one of the sections to read as follows:

"The said company, its successors or assigns, shall make a discount of 10 per cent, from its rates for any service rendered in any municipal building, and shall be required to construct its mains for that purpose not to exceed two blocks. The company or its assigns shall charge a rate based upon the use of bituminous coal containing 14,000 heat units, at a price of $2.75 per ton, f. o. b. Lansing, which rate, on that basis, shall not be in excess of 60 cents per 1,000 pounds of condensation measured by meter. provided. If the price of such coal, f. o. b. Lansing exceeds $2.75 per ton, then the rate may be increased by said company 2½ cents per 1,000 pounds of condensation measured by meter, for each 25 cents increase in the price of the coal. The price of the coal is to be determined by taking the average price of all coal used during the month and striking an average daily consumption of coal for said month; nor shall said company charge more than a reasonable rate for any service rendered."

RESULT OF CHARGE OF HEAT.

Thus if coal went to $5 a ton, the price of heat could be raised 22½ cents over the present price or from 60 cents to 88½ cents.

"This application is made necessary because of the rise in the price of coal, making it impossible for the company to furnish heat on the basis of rates fixed on the original franchise," says the petition. "This is conclusively shown by the attached earnings report, showing the effect that coal prices have had and will have upon the earnings of the company in its steam heating department, such attached report being made a part of this application. In 1905 coal was purchased at 10 cents a ton with a freight rate of $1.35 per ton. These were the figures in actual business experience at that time, upon which the rates written into

Metal "Sylphon" Diaphragm Valves

For Automatic Temperature Regulation

ORIGINATED WITH THE

Johnson System of Temperature Regulation

The Pioneer System and Leader in Improvements

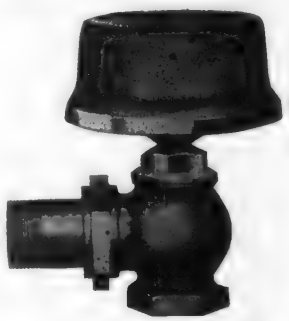
Untested imitations and substitutes followed fast. but, **THE "SYLPHON" IS THE RECOGNIZED STANDARD,** having been thoroughly tested and proved equal to all claims and demands.

It costs no more to install the JOHNSON SYSTEM than inferior products, so why assume the risks?

Communicate with our nearest branch in regard to your temperature regulation requirements.

Our co-operation is yours for the asking.

You can reach us overnight



The indestructible "sylphon" metal diaphragm valve

THE JOHNSON SERVICE COMPANY

FACTORY AT MILWAUKEE, WIS.

New York **Chicago** **Boston** **Kansas City** **San Francisco**

the franchise of June 26, 1905, were based. In 1906 the price of coal had risen so that with the freight added the average price of the coal for the year f. o. b., Lansing, was $2.04. The average price for 1917 is the average price of the coal purchased on the market outside of the contract coal, and as the second and remaining contract will expire July 31st, it will be necessary to pay an average price of not less than $5.62 per ton f. o. b. Lansing, to get the quantity of coal needed for the coming season.

If the petition is favorably acted upon by the city council, it is probable that the increase in rate proposition will be brought up before the city voters at the fall elections. It is necessary for three months to elapse before action can be taken by the people at the polls.

Eddyville, Ia.—No bids were received for heating the court house and county jail and the board is confronted with the possibility of being compelled to install an independent plant.

Williamsport, Pa.—The Williamsport Steam Heat Company will not operate next winter, according to James A. Pugh, secretary-treasurer of the corporation. The company, he said, had not received a sufficient number of responses accepting its advance in rates. This decision will greatly affect a large number of business establishments and private residences. Some time ago Mr. Pugh sent a statement to the consumers served by the steam company, informing them that the labor shortage, with the resulting high cost of labor and the enormous advance in the cost of coal, made it necessary for the company to advance its rates 100%. At a meeting of the consumers Mr. Pugh announced that unless 87% of the consumers accepted the advance in rates, the company would not operate the coming winter. It was not indicated that the company will discontinue operations permanently.

Norristown, Pa.—The Norristown Steam Heat Company has notified its patrons that beginning with the next heating season the rates for heating service would be advanced. Owners of large office buildings, heavy consumers, will be increased 40%, while the householder will be raised 60%. An appeal will be made to the Public Service Commission.

Des Moines, Ia.—After probing the heat franchise election for nearly two months, the Polk County grand jury has adjourned without returning an indictment. During the investigation evidence was presented by

Save Your Profits—with
Johns-Manville Radiator Traps
How often must you send a man back to a job you thought was finished, to readjust leaking radiator traps. And what happens to your profits?
To the plumber or steamfitter, economy is the biggest argument for Johns-Manville Radiator Traps—for they need no adjustment and offer no chance for tampering. Just a body, a connecting union, and a ball—that's all. Condensation rolls the ball up from the outlet, permitting continuous discharge of water and air; the relative levels of the ball, water and outlet are such that a water seal is always maintained which absolutely prevents steam leakage. Nothing could be simpler or more nearly "fool-proof."
Let us send you details of this ingenious money-saver, already a proven success in hundreds of installations.
H. W. JOHNS-MANVILLE CO.
NEW YORK CITY
10 Factories—Branches in 55 Large Cities
JOHNS-MANVILLE SERVICE
COVERS THE CONTINENT
Johns-Manville

the attorney-general, private investigators and the county attorney involving eight Des Moines men in the alleged election irregularities. It was claimed, for instance, that many citizens who never visited the polls were recorded as having voted in favor of the franchise. In one ward, the poll books disappeared and have never been located.

Vulcan Soot Cleaner Co., through the De Ved-Kissick Co., its New York representative, announces that a contract has recently been closed for supplying soot cleaners for 98 boilers for a group of electric light, power and railway companies controlled by the H. L. Doherty Company.

New Incorporations.

Francis J. Guinon Co., Bronx, New York, capital $5,000, to deal in heating and ventilating appliances and systems. Incorporators: G. K. Denman, C. and F. J. Guinon, 1275 College Ave., Bronx.

Portage Light, Heat & Power Co., Cleveland, O., capital $50,000. Incorporators: R. H. Jamison, H. A. Hauxhurst, R. Hall, W. R. Daley and J. H. Kellogg.

National Heating and Ventilating Co., Wilmington, Del. Capital $10,000. Incorporators: C. A. Darby, George G. Steigler and E. E. Wright, all of Baltimore.

L. J. S. Plumbing Corporation, Buffalo, N. Y., capital $5,000, to engage in heating and plumbing contracting. Incorporators: L. F. and M. F. Sigl and E. Vanderbush, Buffalo.

Home Plumbing & Heating Co., Springfield, O., capital $10,000. Incorporators: Frederick L. Krumholtz, John L. Gerrard and others.

Schueler Ventilator Co., Bloomington, Ill., capital $250,000.

Maccmber Mfg. Co., New York, capital $10,000, to manufacture heating and plumbing specialties. Incorporators: Ernest A. Maccmber, H. Romeyn Smith and E. P. Smith.

Austin Heating Corporation, Brooklyn, N. Y., capital $1,000, to manufacture heating specialties. Incorporators: William G. Leahy, Frederick Barley and Charles E. Jones.

John M. Weekes Co., Inc., Syracuse, N. Y., capital $50,000, to manufacture heating and plumbing supplies. Incorporators: J. M. Weekes, M. O. Weekes and H. H. Curtiss, all of Syracuse.

Heating Water with Steam

Requires a Heater that provides for Scale, Corrosion, Split Tubes, Leaky Heads and Expansion Strains

All of these conditions are eliminated in the

Alberger Multi-Head Water Heater

"The Heater without the Usual Heater Troubles"

For Hot Water Service for Hotels, Laundries, Office Buildings, Apartment Houses, Hospitals, Factories, etc

Send for Catalogue

ALBERGER HEATER CO., Buffalo, N. Y.

Western Office: Peoples Gas Bldg., Chicago **Agents in all principal cities**

Sirocco

Will Put Pure Washed Air Into Every Corner of Your Factory

The Dodge Bros. (Motor Cars) Office and Plant are almost exclusively equipped with Sirocco Products.

Their fine office building, here shown, is served by the Sirocco Washed Air System. Their Dining Room, Kitchen, Core Shop, Pressed Steel and Gear Shop have the healthful influence of a constant supply of fresh, properly tempered air. These departments, too, are served by Sirocco Apparatus.

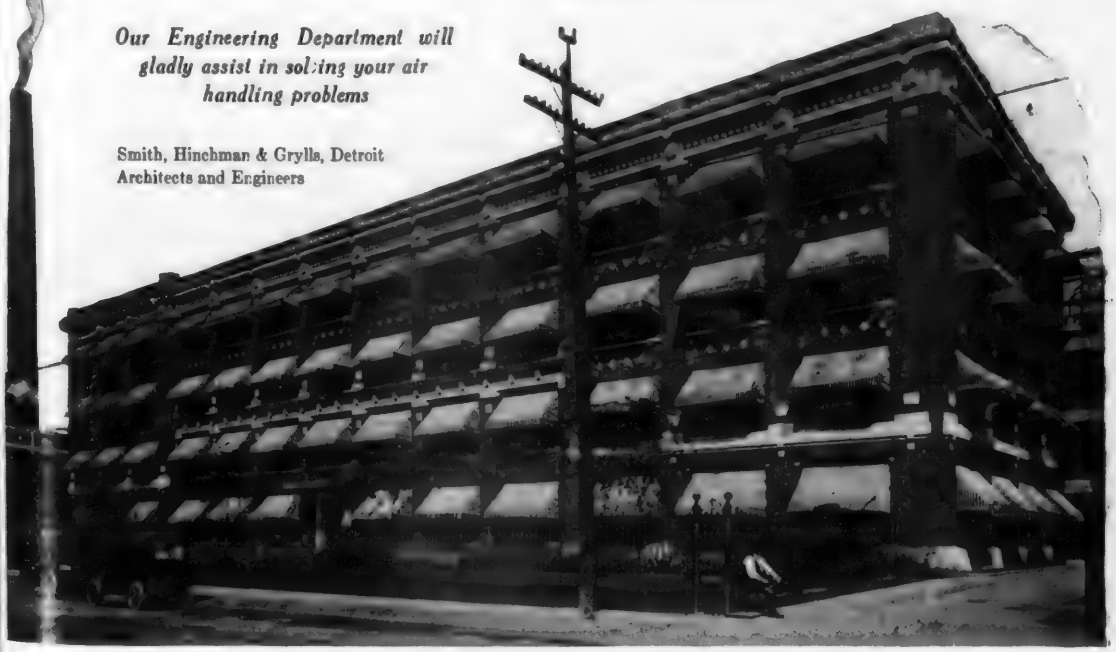
Book No. 2709 illustrates many plants in which "Sirocco" Systems are used. May we send it to you?

AMERICAN BLOWER CO.

DETROIT, MICH.

Our Engineering Department will gladly assist in solving your air handling problems

Smith, Hinchman & Grylls, Detroit
Architects and Engineers



Please mention THE HEATING AND VENTILATING MAGAZINE *when you write.*

Coco Heating System, Clarksdale, Miss., capital $10,000. Incorporators: H. A. Bynum, J. G. Smith and A. J. Mosely.

Furst Plumbing & Heating Co., Richmond, N. Y., capital $10,000. Incorporators: H. J. Neuschafer and C. S. Ashley.

Stephen-Ransom Co., Hornell, N. Y., capital $50,000, to engage in marine steam fitting and plumbing. Incorporators: F. R. Series, H. G. Wensol and Stephen Ransom.

Lyman-Dupuis-Shea Co., Salem, Mass., capital $25,000, to conduct a heating and plumbing business. Incorporators: Michael J. Shea and Damien C. Dupuis.

Ashland Plumbing & Heating Co., Chicago, Ill., capital $2,500. Incorporators: Eugene Folsom, Catherine Folsom and Frank B. Folsom.

P. J. Turnbull Co., Cleveland, O., capital $10,000, to conduct a heating and plumbing business. Incorporators: P. J. Turnbull, W. H. Sletzer and Charles E. Pegler.

Richard Ventilator Co., Baltimore, Md., capital $100,000. Incorporators: John Frank Klos, Leo A. Bowes and A. Graham Boggs, Jr. The new company has taken quarters at 440 Equitable Building.

MANUFACTURERS OF
Equipment and Supplies
FOR
Central Station Heating Plants

Copper Diaphragm Expansion Joints, Slip Joints, Anchor Crosses, Line Anchors, Collars, Manhole-Curbs, Pipe Guides, and The Detroit Condensation Meter

THE DETROIT FEED WATER METER

Central Station Steam Co., Detroit, Mich.

New Firms and Business Changes.

Morrin & Coddington, San Francisco, Cal., consulting mechanical engineers, is the title of a new partnership formed between Thomas Morrin and Albert A. Coddington. The firm will specialize in the design of steam power plants, mechanical equipment of buildings, water works, and in valuations, reports, etc.

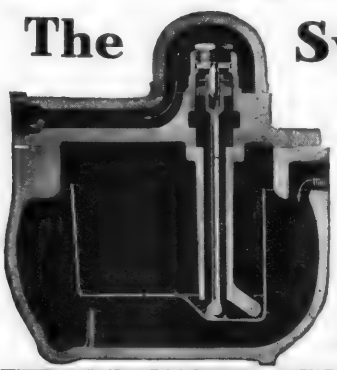
Rolf Heater Mfg. Co., Columbus, O., has increased its capital stock from $15,000 to $30,000.

Sturtevant
(REG. U.S. PAT. OFF.)
Autoforce Ventilators

They utilize wind pressure to create a powerful suction that draws air out of the building. Thus they are enabled to displace three times as much air as any stationary ventilator of the same size, and twice as much as ventilators of the swinging cowl type.
They swing in the lightest winds—work on the same successful principle as steam injector or Hancock inspirator. Made by the largest manufacturers in the world of fans, fan systems, heating and ventilating apparatus.

FULL INFORMATION ON REQUEST
SPECIFY AUTOFORCE
B. F. STURTEVANT CO., Hyde Park, Boston, Mass.
Branch Offices or Agents in all Principal cities

The Swartwout Hydromatic (TRADE MARK) Trap



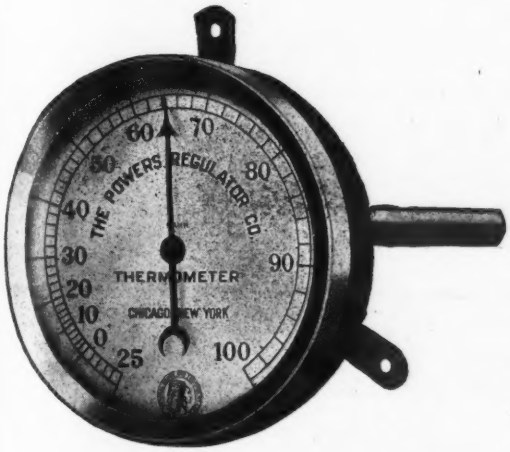
gives as little trouble when you overhaul your heating system as it does in service. Removing the plug at the bottom drains off all sludge collected in the trap. Removing the cap at the top (two bolts) gives access to valve and seat. While the trap is in operation the only two moving parts are self-cleaning at every discharge.

Get the rest of the Hydromatic features in Bulletin 207A—IT'S FREE

THE OHIO BLOWER COMPANY
9211 Detroit Ave. Cleveland, Ohio

Reliable-Readable Reasonable

The ordinary mercury duct thermometer is hard to read. This Powers Thermometer has a white dial with large black figures that can almost be read in the dark. It costs no more than a good mercury thermometer.



Reliable, Readable and Reasonable; designed especially for ventilating work. Three dials only, —25° to 100°; 40° to 140°; 100° to 200°—Fahr. scale.

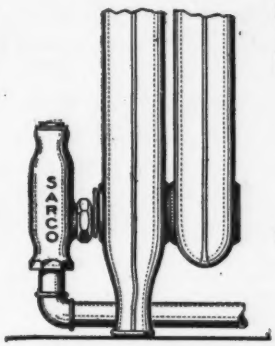
Send for Bulletin 140, with complete information.

The Powers Regulator Co.

Temperature Control Specialists

954 Architects Bldg. New York
2143 Mallers Bldg. Chicago
365 The Federal Street Bldg. Boston
Canadian Powers Regulator Co., Ltd., Toronto, Ont.

Radiator Trap SARCO



For Vapor, Vacuum or Low-Pressure Heating Systems

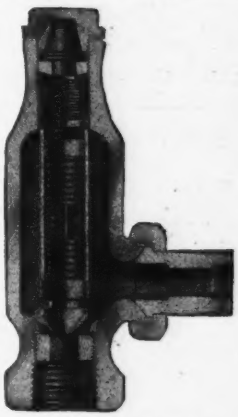
Noiseless, Efficient and Economical Heating

RADIATOR TRAPS "SARCO" render your heating system absolutely noiseless in operation—no hammering, no banging, and no noise or odor from escaping steam.

They soon pay for their installation in making your heating system a more efficient one—more heat with less coal.

These traps are different, are more satisfactory and far cheaper to install than any other trap on the market.

The RADIATOR TRAP "SARCO" receives its impelling force from an oil, hermetically sealed in a strong tube. The difference in temperature between steam and condensation affects the oil and causes it to expand or contract, which ever is present. With expansion the trap is closed, preventing any steam from escaping through the trap. With contraction the trap is opened, permitting the condensed steam or water to flow out and closing just as soon as the steam comes in contact with the oil cartridge. This trap never sticks, clogs, air binds, freezes or leaks.



Write for further particulars today

SARCO COMPANY, Inc.

MANUFACTURERS

Sarco Radiator Traps, Steam Traps, Water and Atmosphere Temperature Regulators

Woolworth Building, NEW YORK CITY
and at Drexel Bldg., PHILADELPHIA
Ellicott Square, BUFFALO
New Telegraph Bldg., DETROIT
Monadnock Block, CHICAGO

Contracts Awarded.

Charles Hoffman Co., Mansfield, O., heating and ventilating West Fifth Street School, Mansfield, for $15,000.

Rise in Prices of Materials.

Following is a list of the principle materials used in the heating industry, showing the increase in the cost of same up to May, 1917, as compiled by the *Gas Institute News:*

	Per cent of Increase
Bituminous coal	86.6
Anthracite coal	18.6
Gas oil	63.9
Oxide	58.3
Copperas	50.8
Sulphuric acid	48.6
Wrought iron pipe	106.3
Wrought iron pipe—extra heavy	50.6
Cast iron pipe	58.8
Steel pipe	57.1
Malleable iron fittings	75.0
Cast iron fittings—3 inch red. T	58.8
Cast iron castings	52.2
Bolts and nuts	160.3
Brass pipe—extra heavy	147.4
Sheet brass	110.3
Copper rods	142.9
Sheet copper	136.8
Sheet lead	57.1
Sheet iron	25.0
Cold rolled steel	200.0
Open hearth steel	150.0
Tool steel	66.6
Plow steel hoisting cable	125.0
Brass cocks—1½-inch T handle	87.6
Kennedy valves	55.4
Packing—Crandall No. 30	20.4
Packing—Peerless flax	57.1
Mill board	33.3
Linseed oil—raw	92.2
Dynamo engine oil	13.3
Cylinder oil	38.9
Mill wipers	27.3
White waste	42.9
Lead wool	37.5

WANTED

Wanted with heating and ventilating contractor, high class estimator who thoroughly understands his business. Good opportunity, steady employment for right man. State experience, age, salary and references. Address, Willing, Box 20, care of Heating and Ventilating Magazine.

Wanted.—Estimator and draftsman on steam, power, heating and ventilating work. Apply by letter, stating experience and salary expected. Address Walker & Chambers, 221 East 41st., New York.

Hide those Radiators!

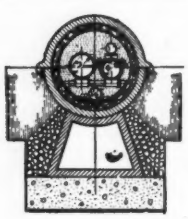
The Ja-Nar is a beautiful cabinet—finished to match mahogany, oak, walnut, and white or tinted enamel. It fits right over and hides the unsightly radiator. In winter the Ja-Nar automatically controls the room-temperature, giving perfect comfort. Operated by sylphon thermostat. Material, workmanship and operation guaranteed.

DEALERS: Write for simplified selling plan.

Send for Catalogue A

THE FULTON CO., Knoxville, Tennessee

141 Broadway, N. Y. Insurance Ex., Chicago



RIC-WIL METHOD

OF

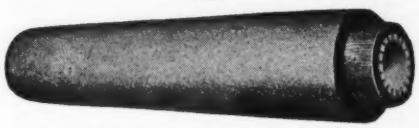
Insulating Underground Steam and Hot Water Pipes

Send for Catalogue

THE RIC-WIL COMPANY

CLEVELAND

STANDARD Steam Pipe Casing



For Insulating Underground Steam Pipe. Tin Lined, or Unlined.

Every salesman has his argument in order to sell the product he represents. Listen to our argument, be the judge, and you will find same not theoretical but practical, and from actual experience.

When you cover your steam line with our make of casing you have the assurance that the line will be constructed so that no heat will escape, and will be water tight as well, with ample space for air chamber.

Should occasion arise that it is necessary to get at the steam pipe, our covering CAN BE TAKEN APART WITHOUT DESTROYING THE STAVES in the sections of casing, and the same casing can be used again. LET US EXPLAIN HOW.

If your line runs in different branches we will build the casing in exact lengths so that you will not have to cut any sections, which means no waste or extra expense to you.

Our method of building covering will be to your interest. Our product is right, attention prompt, and prices low.

SEND FOR BOOKLET

Standard Wood Pipe Co.

WILLIAMSPORT, PA.

The Heating and Ventilating Magazine

VOL. XIV. NO 9.

Contents for September, 1917

Operation of Large Federal Buildings in Washington..*Nelson S. Thompson* 13
With Detailed Data for a District Building, Washington Post-Office and the National Museum Group.

The Heating and Power Plant of a Modern Industrial Building ...*H. S.* 17
Features of Equipment in Factory of Phoenix-Hermetic Company, Brooklyn, N. Y.

Dehydrating Fruits and Vegetables .....*Fred R. Still* 23

Hot Water Heating System of Crane Company's Chicago Works, *F. E. McCreary* 28

Air Cooling Schemes for Houses 36

Air Cooling and Refrigeration 39
Application of Absorption Refrigeration System.

The War and the Heating Engineer 43
Chicago Commission on Ventilation Makes Definite Proposals for Changing Army Cantonment Construction.
Heating Men in Military Service.
Building the Army Cantonments.
Directions for Prevention of Fire.
Recommendations of the United States Food Administration.
Business Men in War Convention.
Engineering Council Appoints Committees.
American Efficiency.

National District Heating Association 46
Committee on National Defense.
Advancement Committee.
Increase in Coal Prices from 1915 to 1917.
Increased Labor Costs a Factor in the Agitation for Higher Heating Rates.
How Much Must Heating Rates Be Increased to Meet Present Costs?

Explosions of Hot Water Heaters and Storage Tanks 48

The Process of "Spellerizing" as Applied to Pipe 50

Reminiscences of an Engineer .....*William J. Baldwin* 51

New Air Measuring Instruments 53

Publicity for the Heating Engineer 55

Correspondence 56
The Development of Temperature-Controlling Apparatus.
Condensation in Engine Cylinders and Its Bearing on Exhaust Steam Heating.

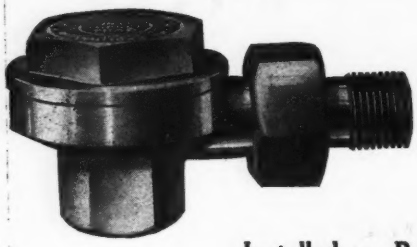
Legal Decisions 58
"Accident" Under Workmen's Compensation Act.
Liability of School District Trustees for Heating System.

Standard Heating and Ventilating Data Sheets 63
No. 10-G—Vent Flue Velocities.
No. 10-H—Duct Areas.
No. 10-I—Duct Areas (Continued).
No. 10-J—Pipe Capacities at Various Velocities.

YEARLY SUBSCRIPTION $1.00 **SINGLE COPIES, 10 CENTS**

Published monthly at Cooperstown, N. Y., by the Heating and Ventilating Magazine Co.

Executive and Editorial Offices, 1123 Broadway, New York



The DUNHAM Radiator Trap

Installed on Radiators in either Vacuum or Vapor Heating Systems insures highest radiator efficiency with absolutely automatic control.

The Dunham Trap is one of the fundamentals of the Dunham Heating Systems. It makes impossible the presence of water in the radiator. Positively prevents all steam waste but allows free passage of air and water of condensation. Prevents pounding and knocking in pipes. Reduces fuel consumption. Causes each individual radiator to heat evenly and quickly. Eliminates the hissing air-valve and spurting water.

Investigate. Write for Bulletin No. 5

C. A. Dunham Dompany

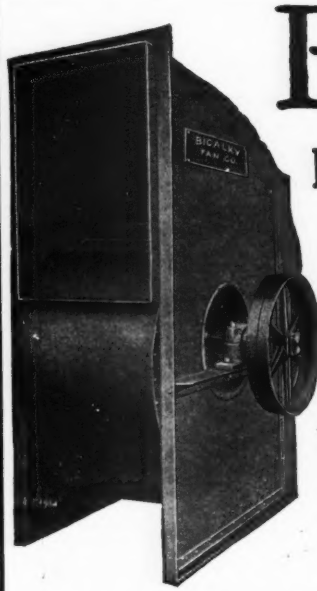
MARSHALLTOWN, IOWA

New York **Chicago** **San Francisco**

CANADIAN FACTORY—TORONTO

Branches in principal cities within the United States and Canada

BICALKY



BI-MULTI FANS

are used all over the country and abroad. They are specified by leading engineers and architects. Their design and construction permit operating these fans at the highest pressure without racking.

The efficiency obtained with these fans has upset all previous engineering dope.

We guarantee results. Write for Catalogue.

Single Inlet Wheel

BI-MULTI FAN WHEELS

are built exceptionally strong. They are guaranteed to stand up and do not rack under the heaviest work that fans are subjected to

This, in connection with their high efficiency, has created the large demand for

BI-MULTI FANS

BICALKY FAN COMPANY

Buffalo, N. Y.

SALES AGENTS

Batterman, Truitt Co., 18-20 East Kinzie St., Chicago, Ill.
J. S. Chapman & Co., 89 Jarvis St., Toronto, Ont.
Schellhammer & Co., Warren Pa.
H. Carlton Hewitt Co., 455 Hipp Bldg., Cleveland, O.
Chas. W. Carll's Sons, 3-7 West Front St., Trenton, N. J.
The O'Keefe-Hayward Co., 1932 Dime Bank Bldg., Detroit, Mich.
Sink & Edwards, 519 Massachusetts Ave., Indianapolis, Ind.
Eagle Roofing & Art Metal Works, 203 Cass St., Tampa, Fla.